

# EXHIBIT 8

**THE U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES  
PUBLIC HEALTH SERVICE  
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY**

convenes the

**EXPERT PEER REVIEW PANEL  
ATSDR'S HISTORICAL RECONSTRUCTION ANALYSIS  
CAMP LEJEUNE, NORTH CAROLINA**

VOLUME II

The verbatim transcript of the meeting of the Peer Review Panel, held at 1825 Century Boulevard, Room 1A/B, Atlanta, Georgia, on Tuesday, March 29, 2005, taken by Diane Gaffoglio, Certified Merit Court Reporter.

**NANCY LEE & ASSOCIATES**  
Certified Verbatim Reporters  
P. O. Box 451196  
Atlanta, Georgia 31145-9196  
(404) 315-8305

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Volume II  
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Legend of the transcript:

[sic]	Exactly as said
[phonetic]	Exact spelling unknown
--	Break in speech continuity
...	Trailing speech or omission when reading written material
[inaudible]	Mechanical or speaker failure
[microphone]	Speaker is off microphone

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**P A N E L I S T S**

(In Alphabetical Order)

ROBERT CLARK, Ph.D., M.S., D.E.E., P.E.  
Environmental Engineering and Public Health Consultant

DAVID DOUGHERTY, Ph.D., M.A., M.S.C.E.  
Principal  
Subterranean Research, Inc.

BENJAMIN HARDING, P.E.  
Principal Engineer  
Hydrosphere Resource Consultants, Inc.

BARRY L. JOHNSON, M.S., Ph.D., F.C.R.  
Panel Chair  
Adjunct Professor, Rollins School of Public Health  
Emory University

LEONARD KONIKOW, Ph.D., M.S.  
Research Hydrologist  
U.S. Geological Survey

ERIC LABOLLE, Ph.D., M.S.  
Researcher  
University of California, Davis

PETER POMMERENK, Ph.D., M.S., P.E.  
Project Manager  
AH Environmental Consultants, Inc.

VIJAY SINGH, Ph.D., D.Sc., P.E., P.H.  
A.K. Barton Professor of Civil and Environmental Engineering  
Louisiana State University

JAMES UBER, Ph.D., M.S.  
Associate Professor  
University of Cincinnati

THOMAS WALSKI, Ph.D., M.S., P.E.  
Vice President, Engineering  
Bentley Systems

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P R O C E E D I N G S

8:07 a.m.

DR. JOHNSON: Good morning. Good morning, one and all, and I hope you all had a restful evening. Before we ask Mr. Maslia for any housekeeping kinds of things, let us welcome one of our panelists, Benjamin Harding, who had airplane difficulties that we've all encountered over our careers. But we welcome you and ask that you, for the record, identify yourself, your affiliation, and lastly to any overarching comments on the materials that you received from ATSDR.

MR. HARDING: I'm Benjamin Harding. I work for a firm called Hydrosphere Resource Consultants out in Boulder, Colorado. And I think, if I had to sum up what I thought in an overarching sense, I would say that the work that's been done here is impressive. One of the things I think that was identified by the other panelists as well is that we need to deal with the issue of uncertainty and try to deal with that in a quantitative way, I think.

DR. JOHNSON: Thank you. Do you know all the other panelists?

MR. HARDING: The ones -- I think I've met everybody at this point, and some of them I knew prior to this time, so...

DR. JOHNSON: Why don't we take a couple of minutes

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1 and just go around; name and affiliation, please.

2 DR. POMMERENK: My name is Peter Pommerenk. I'm with  
3 AH Environmental Consultants.

4 DR. SINGH: I'm Vijay Singh from Louisiana State  
5 University.

6 DR. WALSKI: Tom Walski, Bentley Systems.

7 DR. KONIKOW: Lenny Konikow, U.S. Geological Survey,  
8 Reston, Virginia.

9 DR. UBER: Jim Uber, University of Cincinnati.

10 DR. DOUGHERTY: Dave Dougherty, Subterranean  
11 Research.

12 DR. CLARK: Bob Clark, formerly with EPA and  
13 currently a consultant.

14 DR. JOHNSON: And I'm Barry Johnson, School of Public  
15 Health, Emory University.

16 Morris, do you have any housekeeping things before we  
17 begin today's work?

18 MR. MASLIA: Just, again, to remind anyone if they've  
19 got their cell phones on to silence them or turn them off,  
20 whichever you prefer. And again, any of the audience in  
21 the back here, your conversation can be picked up by the  
22 mikes, even if you're turning to your partner.

23 And one last thing, more towards the -- for the  
24 panelists, Dr. Johnson gave me a homework assignment last  
25 night and to see if we could reduce or perhaps modify the

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1 questions and answers for the second day with respect to  
2 the water-distribution systems, and I did some of that. I  
3 handed Dr. Johnson a copy, and I will hand the panel out a  
4 copy when we get to that time so we can go through them  
5 and cover all of them in a little faster manner.

6 I've combined a couple of them as well. So other  
7 than that, Dr. Johnson, that's it. Oh, the -- if you  
8 haven't deposited your money -- I think it's \$5 for the  
9 working lunch. Ann is taking the money outside. Just,  
10 either at break, leave the money there, and they'll go out  
11 and get the lunch. Thank you.

12 DR. JOHNSON: Okay. Thank you. My purpose in asking  
13 Mr. Maslia to take another look at the list of questions  
14 that bear on the water-distribution systems was that these  
15 questions were prepared some time ago. And he and the  
16 agency have received some information since the  
17 preparation of these questions, and that led to, in my  
18 mind, as to whether all of those questions were still of  
19 importance to ATSDR, and so Morris has reduced the list in  
20 response.

21 With regard to one housekeeping matter from the  
22 Chair, today's agenda shows, at 2:30, us going somewhere  
23 in executive session. And I gather that that was put in  
24 as an opportunity for the panel to sort of closet itself  
25 and say things, perhaps, in the absence of ATSDR staff.

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1           In fact, that would be the case, and we would have  
2           ATSDR staff there initially to answer any early questions,  
3           but I would then ask them to leave so that this would be a  
4           totally candid kind of executive session amongst the  
5           panelists. Do you want to maintain that or forego it and  
6           simply continue all of our deliberations here in a public  
7           forum? And it's -- really, it's up to the panel to  
8           decide. If you feel that need, we'll certainly do it.  
9           What is your preference?

10          DR. CLARK: I don't have any problem with continuing  
11          in a public forum.

12          DR. JOHNSON: Is that all right with all of you?  
13          Tom, is that all right?

14          DR. WALSKI: It's all right with me.

15          DR. JOHNSON: Okay. Then we'll just continue  
16          everything here in public session. And the main thrust of  
17          that executive session was to finish our response to the  
18          four elements of our charge -- the first two, we will  
19          address at the working lunch -- and also to craft some  
20          kind of communique.

21          I asked Mr. Maslia last evening: What did they have  
22          in mind as a communique? And his response was: answers to  
23          the four charges -- and which we will be preparing as we  
24          deliberate this morning and early this afternoon. It  
25          seems like we can fill their desire for a communique and

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1 still doing it all in public session.

2 I also want to alert you that, at the end of our  
3 deliberations and toward the end of the meeting, I'm going  
4 to ask you the same kind of question I asked you at the  
5 beginning, and that is: To what extent are you comfortable  
6 with the, what I call, the protocols that are in play,  
7 both for the groundwater modeling as well as what you're  
8 going to hear today, the water-systems modeling? To what  
9 extent are you comfortable? Are you -- do you have  
10 something you'd like to sort of red letter as key advice  
11 to the agency? But just where are you personally in  
12 regard to what you have heard over these two days?

13 And I don't foresee us taking any kind of vote as a  
14 panel. If you feel that that is a need, then let's  
15 discuss it. But by voting as a panel, it seems to me to  
16 put ATSDR in a bit of a bind and potentially in a bit of a  
17 bind. But they will have the benefit of your advice and  
18 your recommendations as individual panelists. Does anyone  
19 have a problem with the panel, as a body, not taking some  
20 kind of vote on whatever, but speaking as individual  
21 panelists? Tom?

22 DR. WALSKI: I'd prefer it that way. It's pretty  
23 hard to get this group to agree. I mean, Jim and I  
24 probably agree only about 10 percent of the time. So, you  
25 know, it'd be pretty hard to get a unanimity on the panel

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1           here, so...

2           DR. JOHNSON: Well, let the record note that Jim is  
3           smiling (laughter).

4           DR. UBER: It's one of the 10 percent.

5           DR. JOHNSON: Which is part of the 10 percent. Well,  
6           if the panel feels, during the course of the day, to  
7           change some of these suggestions, put it on the table, and  
8           we will -- you will debate it as a panel. Okay.

9           Having said that, Morris, are you ready to begin  
10          updating us on the water -- water-distribution systems  
11          work?

12          MR. MASLIA: I sure am. Good morning, everybody.  
13          And, Claudia, if we can go ahead and get the overview. My  
14          plan this morning is to give an overview of the approach  
15          for the water-distribution systems analysis and then go  
16          into the field testing that we've done to date on the  
17          present-day water-distribution system.

18          And as Bob said yesterday, if you would like to  
19          interrupt me or ask a specific question that's either  
20          among the questions that are there or that comes to you as  
21          you're sitting here, please, feel free to do so, and I  
22          will try to answer it as best as I can.

23          We're all familiar with Camp Lejeune, hopefully,  
24          since yesterday. And again, for the present-day system,  
25          we've got two water-treatment plants and three water-

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1 distribution systems. Just for your information, our  
2 piping network has been obtained from data from autoCAD  
3 drawings, supplied by Camp Lejeune, as well as through  
4 their contractor, AH Environmental, also provided update  
5 on piping. And so it's a combination of information as  
6 well as us being in the field and observing pipes or  
7 asking questions and then defining or having updated  
8 information.

9 This was three bullets of activities based on the  
10 entire project, and we talked about, obviously, yesterday,  
11 the groundwater issue and some uncertainty issues which  
12 still apply to today's issues. But specifically, today  
13 we'll look at the potential distribution of contaminants  
14 and water-distribution system models.

15 And let me just add, as Dr. Johnson mentioned, I  
16 updated the questions and answers that were prepared a  
17 while back based on discussions yesterday. I have not  
18 done that with the slide material. So some of the slide  
19 material is presented, not in contradiction to your advice  
20 or your recommendations, but that they were prepared a  
21 while back. And I thought I would just go with what I had  
22 prepared.

23 So again, the chronology, which we still need to  
24 refine in some areas. The one point to make here: What is  
25 called Montford Point is presently known as Camp Johnson

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1 and is not in existence. It's serviced by the Holcomb  
2 Boulevard water-treatment plant. And the treated water  
3 goes to Tarawa Terrace ground storage, and that's where it  
4 gets its water from.

5 Basically, we were asked by the epidemiologists to  
6 quantify historical exposures for the purpose of their  
7 epidemiologic study. And so our understanding is that if  
8 the systems are completely separated, completely isolated  
9 so you've got three hypothetical systems, they may or may  
10 not have any contamination in them. Then, of course,  
11 there would be no need to reconstruct the actual  
12 distribution system historically, but rather we could  
13 assume everyone would receive the concentration based on  
14 our groundwater modeling and the source concentration  
15 there.

16 Based on information and talking to people to date,  
17 we know at some point in time the distribution systems  
18 have not been operated independently or they have been --  
19 a better word is there's been interconnection. Exactly  
20 how long that is -- we've heard information on two weeks.  
21 We see other data that suggests maybe there were other  
22 opportunities for the systems to be interconnected.

23 And so if that's the case, then we need to do some  
24 amount of historical reconstruction to try to get a  
25 distribution of contaminants within those systems. So, as

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1 we see it, there are two approaches that we can do the  
2 historical reconstruction. One, we can use historical  
3 water-distribution system data. This is data from the  
4 operators of the system, cycling on and off of wells,  
5 flows, demands.

6 And what we have at least found out, in looking for  
7 information, is that the information is sporadic. We  
8 talked about that yesterday. There may not be any record  
9 specifically of cycling on and off pumps and wells, or it  
10 may not be in existence. Bob, did you have a question?

11 DR. CLARK: Morris, yeah, I had a question on the  
12 exposure assumptions. You're assuming that everybody who  
13 lives in a system that's independently operated is  
14 exposed. Is that --

15 MR. MASLIA: That would be the assumption.

16 DR. CLARK: Okay. But you're not taking into  
17 consideration things like activity patterns --

18 MR. MASLIA: No, we're not.

19 DR. CLARK: -- water use by individual homes and  
20 that sort of thing?

21 MR. MASLIA: No. If you wanted to take into account  
22 water use, you would either have to have some measured and  
23 demand-type consumption metered information. At a Marine  
24 Corps base -- and I assume at military bases in general --  
25 they do not meter household water. We'll actually address

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1           that issue a little later on.

2           And as such, they do have -- they've got a production  
3           meter, obviously, that's going into the system. But  
4           because in some of the areas you've got mixed use -- say  
5           bachelor housing, industrial. In some of the areas, it's  
6           more homogeneous: total family housing. We would have to  
7           derive some estimates of that.

8           DR. CLARK: Right. To the degree that you can't do  
9           that, then that constitutes the potential for error, I  
10          guess, in the analysis.

11          MR. MASLIA: Yes.

12          DR. CLARK: I guess Frank's not here.

13          MR. MASLIA: Yes. Just as an example, when we were  
14          doing the work in Dover Township, we had quarterly billing  
15          records for about 18 or 24 months, and we -- I shouldn't  
16          say "we." I should say Jason put those in about a month  
17          at a time, putting them in by hand.

18          But they came out. Where we measured, I think it was  
19          7.5 million gallons per day on a test. With the billing  
20          records, we came out with 7.6 million gallons. It was  
21          right on target. We don't have that here, and it's -- so  
22          that's just not available.

23          DR. WALSKI: Okay. It did bring up the question of  
24          historical data. One other source of data is the fact  
25          that a lot of the engineering work of this in the past was

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1 done by the NAVFAC IINCOM LANDTIV up in Norfolk, and I  
2 haven't heard them mentioned. Have you gone up through  
3 their records? They may have some of the construction  
4 drawings and such that, you know, they don't have on post.  
5 Have you talked to --

6 MR. MASLIA: Let me talk about that now. We do have  
7 historical maps as paper copies, for example, as housing  
8 areas expanded. We've actually got maps that tell us how  
9 many more housing units were added and which pipelines may  
10 have been added. So from that standpoint, we do have that  
11 information.

12 When we've requested, even on the present-day system,  
13 say, for example the network drawings, if they haven't had  
14 them at Camp Lejeune, they have provided it to us either  
15 through their consultant. So I assume if they haven't had  
16 it on base, they have gone up to the Navy facilities. We  
17 are aware of that.

18 And, in fact, on the -- which I'll get to a little  
19 bit later on. There was a conservation study done. Most  
20 -- the Air Force and Navy developed this water-  
21 conservation analysis, a software. And we requested it,  
22 and I know they did go up to Norfolk to get a copy of  
23 that, and actually, that has formed the basis for some of  
24 our demand categorizations.

25 So I'll get into that, but we are aware of that, and

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1       when needed, we have requested. But we personally have  
2       not gone up there, but we know someone has gone up there  
3       because of the information that we've obtained. Were  
4       there any more questions up to that?

5               The second approach then would be to -- in view of  
6       the lack of historical system operation-type information  
7       would be to develop a present-day system model; gather  
8       information on that; and then to, what we're calling,  
9       deconstruct the present-day system: removing pipes as they  
10      were removed historically and using the assumption that  
11      we've been told that they pretty much operated in a  
12      similar manner; use that to do the historical  
13      reconstruction or come up with historical systems.

14             Now, one of the differences we have found out, say,  
15      from the Dover Township work, unlike in Dover Township  
16      where the network changed at least every year, whether it  
17      was addition of pipes, hydraulic devices, or anything,  
18      there were just major -- major changes in only certain  
19      years at Camp Lejeune, for example, the addition of the  
20      Holcomb Boulevard plant.

21             From what we've been told and what we've been able to  
22      find out, they were not adding sections of pipelines every  
23      year. That sort of simplifies, at least from a simulation  
24      standpoint, where we can make some larger assumptions. So  
25      that we have found out, and that is why it's still very

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1 important on this chronology, especially with the Holcomb  
2 Boulevard plant. If we can isolate that, the start-up, to  
3 a month and year, it will really help us out.

4 And this is the approach up to this time that we have  
5 been using to calibrate models for the present day; get a  
6 description of the present-day system in terms of  
7 operation, in terms of facilities; and then work backwards  
8 in time. The information in front of you and what we've  
9 been -- and what we'll discuss today, obviously, is just  
10 for the present-day system, but hopefully, we can also get  
11 some recommendations for the historical process.

12 And that's -- so the approach then would be to apply  
13 the output from the groundwater model, and that's the  
14 arrival of the concentration from the contamination. And  
15 then either apply it to Approach A or B, and as I've  
16 indicated, we have gone with Approach B because of the  
17 lack of information from the historical standpoint.

18 And that's really a summary of just the approach and  
19 what has prompted us to take the next step, which is the  
20 field investigation and understanding the present-day  
21 system. So at this point, are there any other specific  
22 questions on the approach? Yes.

23 MR. HARDING: Morris, there's a high-level question  
24 from the -- going up to 20,000 feet and looking at this  
25 for a minute -- and this may have been answered yesterday

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1       since I wasn't here, so if it has, just somebody can take  
2       me aside and tell me.

3               And that is, is that in the event that or in the case  
4       where -- these systems were served by a single source  
5       essentially. The wells were blended into a water-  
6       treatment plant and then supplied to the distribution  
7       system, and those systems weren't interconnected then.

8               MR. MASLIA: Did you say were or were not?

9               MR. HARDING: Were not.

10              MR. MASLIA: Okay.

11              MR. HARDING: So we have independent systems served  
12       by a single point of supply. Then there's really no need  
13       for any hydraulic modeling in my understanding of the kind  
14       of etiology of disease that we're talking about. That is,  
15       these are chronic, relatively chronic, exposures.

16              So we don't need to know, with a precision of hours  
17       or even days, when a particular change in concentration  
18       occurred. So the calculation -- essentially, everybody in  
19       the system -- when you're averaging things out over a  
20       period of days or weeks, even that level is going to get  
21       the same exposure, the same concentration.

22              So it seems to me useful to divide this up into the  
23       epochs, if you will, of the configuration and operation of  
24       the system and decide, you know, what the benefit is of  
25       doing the detailed hydraulic modeling and when that

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1 benefit's going to accrue because at some point -- at some  
2 points, all of the uncertainty, all of the arithmetic  
3 basically falls on the groundwater model. And at that  
4 point, once you know the answer to groundwater model and  
5 the dispatch of the wells -- if you've got innumerable  
6 wells, you have to understand that. Once it gets into the  
7 water-distribution system, it's no longer an issue.

8 MR. MASLIA: Right.

9 MR. HARDING: So we need to understand that to  
10 evaluate when you need to do, if you need to do, the  
11 detailed hydraulic modeling.

12 MR. MASLIA: Our assessment of the water-distribution  
13 system, when we were first presented with the opportunity  
14 to assist our division of health studies on the  
15 epidemiologic study, was really twofold.

16 First -- and I am not an epidemiologist. I'm  
17 probably stepping way off on the plank here. But my  
18 understanding on some of the health outcomes, birth  
19 defects, there -- they need some information in the first  
20 trimester, and I think it's Days 21 through 28 or  
21 something like that. So they had mentioned some daily  
22 information to us, and Dr. Bove is not here. But David --

23 MR. HARDING: I probably can answer most of the  
24 questions.

25 MR. MASLIA: Okay.

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1 COURT REPORTER: I need you to get to a mike then.

2 MR. MASLIA: Oh, okay. But that was our -- one of  
3 the questions we had: Could we provide that kind or at  
4 least on a monthly, looking at trimesters, monthly  
5 information. Yes.

6 DR. CLARK: I wonder if everybody would be equally  
7 exposed because you're talking about people that may --  
8 you know, women who might be in the household, maybe, 18  
9 hours, 16 hours a day with children as opposed to some of  
10 the active-duty Marine Corps personnel who are off doing  
11 something else.

12 And I wondered if maybe one way to deal with that is  
13 sort of at least classify the percent of population who  
14 falls into these different categories who would have  
15 different kinds of exposures.

16 MR. MASLIA: We started down that road, and that's in  
17 the next presentation or at least classifying building  
18 types and the type of people that occupy those buildings,  
19 and that's in the next presentation. And it significantly  
20 varies by the different distribution systems, which I will  
21 get into. Can I put that off until we get to that? Yes.

22 DR. UBER: A point of clarification on that, Morris:  
23 You're only concerned with exposure of pregnant women.

24 MR. MASLIA: That's right.

25 DR. UBER: Okay.

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1           MR. MASLIA: That's right. Women who were living in  
2           family housing, although they may have given birth off  
3           base --

4           DR. UBER: Right.

5           MR. MASLIA: -- because of the movement of the  
6           enlisted people, the enlisted men, as they took them off  
7           base. Some of them may have been pregnant during the  
8           period of exposure while on base, but then actually  
9           delivered off base.

10          DR. UBER: Right. Understood. But the exposure  
11          characteristics, the only ones that are of interest, are  
12          the exposure characteristics of the women who had been on  
13          base at some time during first trimester of pregnancy.

14          MR. MASLIA: Well, there's Dr. Bove. Let him --

15          DR. BOVE: What happened?

16          MR. MASLIA: The question was: We're interested in  
17          exposure of women, pregnant women, who were on base during  
18          only the first trimester.

19          DR. BOVE: No. That's for -- well, we have different  
20          outcomes, end points. I know I have to get to the mike.

21          COURT REPORTER: You knew what was coming.

22          DR. BOVE: Right. We have different end points, and  
23          for neural tube defects and oral clefts, it's the first  
24          trimester. But we -- because there's some uncertainty as  
25          to when the first trimester occurs, we asked for three

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1 months. We asked for the whole year before birth. And  
2 we're looking at the first six months of that period:  
3 three months before conception, three months after  
4 conception because we don't know when conception really  
5 is.

6 So we leave a wide window there to determine exposure  
7 for oral clefts and neural tube defects. For childhood  
8 leukemia, since we're not sure -- all the evidence seems  
9 to indicate prenatal exposure, but we'll ask up to one  
10 year of life for childhood leukemia and non-Hodgkin's  
11 lymphoma.

12 DR. UBER: Okay. So you're interested in exposure of  
13 women three months before pregnancy, three months --

14 DR. BOVE: Conception; yeah.

15 DR. UBER: -- three months before conception --

16 DR. BOVE: Yeah.

17 DR. UBER: And three months after conception and --

18 DR. BOVE: Because we're not sure when conception is.  
19 Right.

20 DR. UBER: Right. And you're interested also in  
21 exposure of infants.

22 DR. BOVE: For childhood leukemia --

23 DR. UBER: Childhood leukemia.

24 DR. BOVE: -- up to one year of life.

25 DR. UBER: But you're not concerned about exposure of

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1 active-duty military personnel who are -- I assume -- I  
2 can't remember when that changed, but I assume at that  
3 time they were all men.

4 DR. BOVE: Well, we're going to be asking in -- their  
5 drinking-water exposure, no. No. We're concerned about  
6 other exposures. We ask a wide range of questions in an  
7 interview. Okay.

8 DR. UBER: But not for drinking water?

9 DR. BOVE: But not for drinking water, no. I think  
10 -- we're really focused on that period of time. Okay.

11 MR. HARDING: Before you go --

12 DR. BOVE: Uh-huh.

13 MR. HARDING: Morris, let me just express --

14 DR. BOVE: I'm not going. I'll just sit there.

15 MR. HARDING: -- my understanding of how this system  
16 worked and ask a question of both you and Dr. Bove, which  
17 is if we go back to the case that I mentioned where we've  
18 got a situation where the system operated independently  
19 and was served by one water-treatment plant, then what  
20 came out of that water-treatment plant was going to reach  
21 a home in a matter of days or hours. It would stabilize,  
22 given the operation of the tanks. But if we look at the  
23 historical data we have a few snapshots here that Tarawa  
24 Terrace -- Tarawa Terrace. How do you pronounce it?

25 MR. MASLIA: Tarawa.

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1           MR. HARDING: Tarawa was pretty stable. The  
2           measurements that were made in the water-distribution  
3           system were all within the factor of one and a half of  
4           each other, it seems like. So my question here is that  
5           when the wells -- the major influence then on the  
6           concentrations in that system would be the cycling of the  
7           wells if the wells in a well field had different  
8           concentrations, which might occur three times a day, it  
9           sounds like, something like that.

10          So for the question for the doctor, assuming that  
11          that understanding is correct, then is: What is your time  
12          resolution in terms of understanding? What kind of  
13          averaging period is acceptable to you, and what kind of  
14          precision on estimates of, ultimately, human intakes that  
15          you're going to make as you assess this? What's your  
16          level of precision both in terms of time and magnitude  
17          that's -- that you need to have in order to make a  
18          conclusion?

19          DR. BOVE: I mean, we're going to be looking at  
20          monthly averages. So to do that, you know, at least  
21          weekly levels. But beyond that, it's unclear. It depends  
22          on how variable the data is, I guess. If there are spikes  
23          during a particular time, we'd like to capture that. But  
24          if there aren't, then, I guess, by week -- week by week.

25          COURT REPORTER: Can you go to the mike, please?

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1 DR. BOVE: Yeah. A week-by-week assessment might be  
2 sufficient. You know, again, it depends on whether there  
3 are peaks. If, in fact, the water that went in was also  
4 the first water that came out and there are times when  
5 there are slugs going out so that the tap-water sample  
6 data that we have is not really reflective of what might  
7 occur at the tap. In other words, you know, it may be  
8 more closely related to that -- what's in that well  
9 actually than -- so there would be, instead of 200 parts  
10 that would bring us to the max, something like ten times  
11 that much, we'd like to be able to capture that, I guess.

12 MR. HARDING: That's what my question is: Are we  
13 dealing here -- orders of magnitude differences?

14 DR. BOVE: Well, that would be. Yeah.

15 MR. HARDING: Right. But, I mean, but you have to  
16 answer this because you've expressed this desire to have a  
17 six-month window of time. And the question is: Do you  
18 need to know what happened in the third week of that six-  
19 month window with a precision of two or ten or what? This  
20 is what I'm getting at.

21 MR. MASLIA: Frank was asking me what we did in Dover  
22 Township. And in Dover Township, they used the same  
23 approach of going zero months, not knowing when  
24 conception, to twelve months and the --

25 MR. HARDING: What was the resolution?

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1           MR. MASLIA: And the resolution -- the model was  
2 obviously run on an hourly basis, and then we gave them an  
3 average over a month period.

4           DR. BOVE: But we weren't -- we weren't -- we weren't  
5 dealing with concentration at Toms River.

6           MR. MASLIA: No. No.

7           DR. BOVE: I mean, it's a tough question because  
8 there's so much uncertainty. I'm more concerned about  
9 being able to just determine whether people were exposed  
10 or unexposed, given some of the things you'll probably  
11 hear today about the confusion concerning interconnections  
12 and so on.

13           But if we can get that straightened out, if I can be  
14 confident that the people I'm calling unexposed are  
15 unexposed and vice versa, which we -- I produced something  
16 that -- yesterday that was handed out to you, which goes  
17 over what happens when you can't -- when you have some  
18 errors in just doing that and the impact on the odds  
19 ratio. If we can get that far, then I can live with  
20 weekly -- certainly, weekly estimates about resolution.

21           MR. HARDING: Well, but you're talking about were  
22 they exposed in a given week or were they exposed in a  
23 six-month period? Yes or no? What is it --

24           DR. BOVE: Oh, no. We -- there's two things here.

25           MR. HARDING: It's like two things here.

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1 DR. BOVE: I'm sorry. Well, I'd like to know on a  
2 weekly basis whether they were exposed. Okay.

3 MR. HARDING: Whether they were exposed.

4 DR. BOVE: Yeah.

5 DR. LABOLLE: You mentioned at Toms River, you didn't  
6 -- you weren't concerned with concentrations. Are you  
7 concerned with concentrations here, or are you concerned  
8 with mass?

9 MR. MASLIA: Let me explain here. It's not that --  
10 that's probably a misstatement. It's not that we were not  
11 concerned with concentrations at Toms River. We had an  
12 alphabet soup of concentrations that we could not separate  
13 out or get any definitive single contaminant like PCE  
14 coming through there because of the way that the  
15 contamination that was on hand.

16 So because of that -- and this, again, was part of  
17 the epidemiologic protocol -- it was decided by the  
18 epidemiologist to go after the proportionate amount and  
19 look at comparative amounts of water that each of the  
20 study cases received or did not receive from various well  
21 fields.

22 DR. BOVE: What I meant was it wasn't part of the  
23 analysis.

24 UNIDENTIFIED PANELIST: Okay.

25 DR. BOVE: It wasn't part of the exposure assessment.

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1 DR. CLARK: Morris, I had a question. This may be  
2 going -- it may address this later on, but is -- have you  
3 looked at degradation by-products in the distribution  
4 system at all?

5 MR. MASLIA: No.

6 DR. CLARK: Okay. Because you've got a lot of cast  
7 iron pipe that's going to build up a very heavy biofilm.  
8 You've got lots of biological activity going on, and I'm  
9 wondering, with the residence times that you have, if it  
10 might not be something you might want to take a look at.  
11 I assume when the analysis was done -- a lot of them were  
12 done with just plain -- just the same volatile analysis  
13 using GC, right, back in the early days when they were  
14 looking for THMs primarily?

15 MR. MASLIA: That's what the lab notes indicate, and  
16 that's what they indicate why they could not do it when  
17 they saw the presence of the volatile or --

18 DR. CLARK: So there's no attempt to try to, say,  
19 differentiate to see if vinyl chloride might be possibly  
20 one of the by-products or not?

21 DR. BOVE: Well, they did later.

22 MR. MASLIA: Later on, they did.

23 DR. BOVE: Not during the THM -- not during the THM  
24 analysis; no.

25 DR. CLARK: I know there's a period there when there

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1           were no methods, the standard EPA methods were volatile,  
2           so...

3           DR. BOVE: The issue's about biofilms and residence  
4           time.

5           MR. MASLIA: Not in Tarawa Terrace. It was --

6           DR. BOVE: Okay. So there's no dead-ends.

7           DR. CLARK: But there were -- do you know what --  
8           well, you know what the residence times are in terms of  
9           the system tanks and so forth; right?

10          MR. MASLIA: From what we found from our field  
11          information -- and I'll present that --

12          DR. CLARK: Okay.

13          MR. MASLIA: -- the residence times may be forever.

14          DR. CLARK: Okay.

15          MR. MASLIA: And that's one of the issues that we  
16          discovered -- or when I say we discovered, during our  
17          field testing -- and I'll get to that. I'll just jump to  
18          the punch real quick. Even though we allowed fluoride to  
19          dilute over a two-week period down to .1 or .2 milligrams  
20          per liter, the tanks are still showing one or a little bit  
21          above after that.

22          DR. CLARK: So there is the potential then for very  
23          long residence times, biological action, and --

24          UNIDENTIFIED PANELIST: (Off microphone)

25          MR. MASLIA: Not the -- I mean, it is.

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1 DR. WALSKI: Well, but just the opposite though.  
2 When you had the tanks off-line, that means everybody gets  
3 very fresh water. The water in the tank just sits there,  
4 and so 99 percent of the people get water that goes  
5 straight from the plant to their house, which means the  
6 residence time on average is, you know, hours only in the  
7 system, not days. And the water in the tank just sits  
8 there.

9 MR. MASLIA: Right.

10 DR. WALSKI: It may dribble back in a little bit --

11 MR. MASLIA: Talking about in the tanks?

12 DR. WALSKI: Yeah, right; in the tanks. The tank  
13 water doesn't get consumed. So therefore that water is  
14 basically almost off-line except during a fire or  
15 something is the only time that water gets drained out of  
16 the system. So for the most part, the residence time on  
17 average is extremely short in a system like this.

18 MR. MASLIA: Except we've seen both, both cases. And  
19 I'll get into that now perhaps. But we've seen in a later  
20 test the tanks filling and drawing, and I've got some data  
21 to show that. So --

22 DR. CLARK: Well, I think it depends a lot on what  
23 the record shows as far as tank operation is concerned.

24 MR. MASLIA: So that -- again, our attempt or our  
25 concept was, if I can summarize this, is if we felt -- if

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1       we could really understand the present-day operation, that  
2       would shed a lot of light on historical operations since  
3       we were told they were operated in a similar manner or the  
4       operation was in a similar manner, and that was our --

5             DR. CLARK: So it sounds like there were times when  
6       the residents would get water that was fairly aged.

7             MR. MASLIA: There were times; yes.

8             DR. WALSKI: But it would be aged in tanks though,  
9       not in pipes with contact with the biofilm that much. In  
10      the tank, you don't have much contact with the wall.

11            MR. MASLIA: Right. But again, we've got data to  
12      show both cases or at least our interpretation of it, that  
13      it shows both cases.

14            DR. CLARK: You still have biological activity taking  
15      place in the tank, too, as you know. So those are just  
16      some issues I thought that you might want to at least kind  
17      of chalk up and take a look at.

18            MR. MASLIA: We'll definitely note that down. And,  
19      in fact, we're looking at different tank-mixing models,  
20      just to let you know. Are there any other questions,  
21      suggestions, comments, or -- because what I'd like to do  
22      is get into the specificity of the present-day system and  
23      the field testing that we've done and perhaps address some  
24      of the issues that have been brought up this morning and  
25      go from there. Is that okay with the panel?

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1 (No audible response)

2 MR. MASLIA: Okay. Present-day system. Okay. We  
3 started preparing to do some field tests. Again, the  
4 present-day information, we had some production  
5 information from the utility operators, but specificity as  
6 far as hydraulics in the present-day system were not  
7 available, and we were, again, interested in ultimately  
8 travel times of potential contaminants. So we developed a  
9 field-testing program. And so we gathered information on  
10 pipeline locations.

11 I've described how we have obtained that for the  
12 present-day storage tank locations; high-lift pump data;  
13 operational data -- I'll get into the controlling tanks in  
14 a minute -- and production data; and what I'm referring to  
15 housing data and facilities' use data, classifying the  
16 different building types.

17 The approach was to construct present-day models, and  
18 we've done that for the three different areas: for the  
19 Tarawa Terrace, the Holcomb Boulevard distribution system,  
20 and the Hadnot Point. And the data that we were  
21 interested in gathering would be the hydraulic data,  
22 pressure, C-factor data for pipeline characteristics,  
23 operational data. This is including the controlling tanks  
24 and the on-off cycling of pumps, pipe-flow data, and  
25 travel-time data.

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1           Primarily, our thought behind the flow data was that  
2           since we didn't have individual household meters and  
3           household consumption, if we could get an aggregate of  
4           small areas where the type of housing were homogeneous,  
5           then we could get a present-day per capita use and per  
6           diurnal type curves to service for that particular area,  
7           and that was our thought behind the flow metering.

8           So as of right now, we've got three hydraulically  
9           independent models. We're assuming here's where the  
10          interconnection between Hadnot Point and Holcomb Boulevard  
11          are. There are two sets of valves, one here and one here,  
12          that are closed off. And so we've got a model for the  
13          Tarawa Terrace-Camp Johnson area --

14          MR. HARDING: Morris, I got an ADH --

15          COURT REPORTER: Mike please. I didn't get it.

16          MR. HARDING: I'm color blind. I can't really make  
17          out that pointer very well. Can you just linger a little  
18          longer or point with your --

19          MR. MASLIA: Okay. Can I go over there and point to  
20          it? Will that be okay?

21          MR. HARDING: That would be great. Just where the  
22          valves are because that's a critical issue for me.

23          MR. MASLIA: Is there a pointer over here? How about  
24          the pointer and that way?

25          MR. FAYE: Grab the radio mike.

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1 MR. MASLIA: Thank you.

2 COURT REPORTER: Now you're getting it (laughter).

3 MR. MASLIA: Is that on?

4 MR. FAYE: Yeah.

5 MR. MASLIA: Okay. This is the Hadnot Point area --

6 MR. HARDING: Right.

7 MR. MASLIA: -- to the south, and there's an  
8 interconnection valve here and one over here or a set of  
9 valves actually that they maintain closed for the present-  
10 day system. This area up and to here is what we're  
11 referring to as the Holcomb Boulevard water-distribution  
12 system. And then this pipe right here from the treatment  
13 plant provides water to the ground storage at Tarawa  
14 Terrace. And then based on demands and the controlling  
15 tank right here, that's how water is distributed within  
16 the Tarawa Terrace area up north.

17 Previously, when we mentioned the Montford Point  
18 here, that was in this area over there, which is present  
19 day no longer in existence at that treatment plant.

20 MR. HARDING: So when Tarawa Terrace was isolated, it  
21 was that pipe that crosses Northeast Creek there right by  
22 the 30, TT-30?

23 MR. MASLIA: Right there. This pipeline comes over  
24 there. And if you cross the bridge, you can actually see  
25 the pipe tied or bolted underneath the bridge, the bridge

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1       there. And it comes into here. So what's left -- this is  
2       where the original or the former Tarawa Terrace treatment  
3       plant was. So the pump house is still there. They've got  
4       four high-lift pumps there. And the reservoir,  
5       underground storage tank, is still there. Just the  
6       treatment facility is no longer there.

7               MR. HARDING: Now, if I recall from the materials,  
8       there was a failure in that pipe due to freezing; is that  
9       right?

10              MR. MASLIA: That, I believe -- we discussed this  
11       yesterday. And I believe that's this pipe right here, and  
12       that is information we're still trying to get some more  
13       definitive documentation on. It's a report that was  
14       written in 1991 by Geophex out of Raleigh, North Carolina.  
15       We've got a contract number. We have no author that's on  
16       it.

17              We're trying to really -- and it makes a statement  
18       that two years prior, meaning about '89 or so, which is  
19       outside the study period -- but that might be some  
20       indication that there may have been other times that there  
21       may have been some interconnections, but that's some of  
22       the data discovery that we still need to figure out and  
23       find a resolution on.

24              MR. HARDING: Well, there's valves on the pipe -- the  
25       systems are isolated or were isolated by valves; right?

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1           MR. MASLIA: This system and this system were  
2 isolated.

3           MR. HARDING: So the indication was that pipe was  
4 only constructed after 1985, the one across Northeast  
5 Creek?

6           MR. MASLIA: Yes. That would be correct.

7           MR. HARDING: Okay.

8           MR. MASLIA: Okay. In other words, because prior to  
9 the closing of this treatment plant, this treatment plant  
10 took care of this area here. So there would be no need  
11 to --

12          MR. HARDING: But that can't be right because  
13 originally Hadnot Point served the entire system; right?

14          MR. MASLIA: That was before Holcomb Boulevard plant  
15 came into being.

16          MR. HARDING: So that pipe existed from the very  
17 early days of Tarawa Terrace development.

18          MR. MASLIA: This pipe here?

19          MR. HARDING: Yeah. The pipe that crosses Northeast  
20 Creek.

21          MR. MASLIA: That, I could not tell you. Joel, would  
22 you know about that? Would that pipe have existed prior  
23 to the -- no.

24          MR. HARTSOE: Excuse me. The -- what he's talking  
25 about is the --

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1 COURT REPORTER: Excuse me. Microphone.

2 MR. HARTSOE: At one time, Hadnot Point served the  
3 Midway Park area. That's up north, right there. And the  
4 connection that he was talking about, there's two separate  
5 connections between Hadnot Point and the Holcomb Boulevard  
6 distribution system. But, at one time, when the Holcomb  
7 Boulevard plant was not there, the Hadnot Point served  
8 only up north at the Midway Park area. It did not serve  
9 TT.

10 MR. HARDING: Okay. And so do we have a sense that  
11 that pipe that crosses Northeast Creek was constructed  
12 after 1985?

13 UNIDENTIFIED AUDIENCE MEMBER: (Off microphone)

14 MR. HARDING: Do you know when it was constructed?

15 MR. MASLIA: We've probably got that information in  
16 our --

17 DR. POMMERENK: Like I indicated yesterday, there  
18 seemed to be as-built drawings from 1984. And in  
19 discussing a little more, there may have been a temporary  
20 line for some time. But, you know, this is, like Morris  
21 said, all not clear at this time, when this -- but it  
22 probably wasn't -- hasn't gone on-line, you know, before  
23 '84.

24 MR. FAYE: Is this on? The records that we have  
25 indicate that that pipeline was constructed by June of

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1 1985 or in that fairly short time frame and it was  
2 operating in June of 1985 or shortly thereafter.

3 DR. LABOLLE: Is it your understanding that it was  
4 constructed to help mitigate the closure of --

5 MR. FAYE: Yeah.

6 DR. LABOLLE: -- Tarawa Terrace?

7 MR. FAYE: Yeah. There was a recognized -- they --  
8 as I said yesterday, Wells TT-26 and TT-23 were shut down  
9 in February of '85. That -- and Lejeune immediately  
10 anticipated a water shortage for the Tarawa Terrace area,  
11 up into the spring and summer months, because of that  
12 shutdown.

13 So they expedited this construction of this pipeline,  
14 to the best of my knowledge, so -- and it was -- to the  
15 best of my knowledge, it was supplying water from Holcomb  
16 Boulevard to Tarawa Terrace to supplement their existing  
17 supply by the summer of 1985.

18 MR. HARDING: Okay. Morris, I have another question.

19 MR. MASLIA: Sure.

20 MR. HARDING: And so is the epidemiological study  
21 driven by particular individuals or time frames, or are  
22 you trying to establish the dose-response ratio? In other  
23 words, could you -- after that pipeline is in place in the  
24 situation in Tarawa Terrace, if the wells and the Holcomb  
25 Boulevard supply both served the area -- it gets

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1           complicated.

2           But, prior to that time, it's not complicated at all.  
3           The only complication is how they dispatched the wells and  
4           the groundwater modeling. If I understand this correctly  
5           -- anybody can jump in if they think I'm wrong here. But  
6           prior to that time, you've got a much clearer picture.  
7           It's not perfectly clear, but it's much clearer than it's  
8           going to be after that pipeline opened.

9           MR. MASLIA: Yes. The epidemiologic study ends in  
10          December of 1985.

11          UNIDENTIFIED AUDIENCE MEMBER: Last birth; yes.

12          MR. MASLIA: Yes. Last birth is December of 1985.

13          MR. HARDING: It's that last -- it's that period  
14          from, potentially, 1984, some time in 1984, until December  
15          of 1985 that's going to drive 90 percent or 95 percent of  
16          your water-distribution effort.

17          MR. MASLIA: Plus we've got the potential issue,  
18          which we've been asked on a couple of occasions now, about  
19          the interconnection between Hadnot Point and Holcomb  
20          Boulevard.

21          MR. HARDING: I understand. I'm just trying to get  
22          one thing done first.

23          MR. MASLIA: Okay.

24          DR. WALSKI: But the point is, though, that if you  
25          don't have enough information to know how to do things

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1 without the model, running this bad raw data through a  
2 model isn't going to make it any better. You know,  
3 because the boundary conditions are what's going to drive  
4 the model. And so we're still in the -- you know, back to  
5 the fundamental principle of modeling, which is: Garbage  
6 in; garbage out.

7 And you don't know when those things are open or  
8 closed. And you aren't ever going to know those things  
9 because we can't go back in time and ask people or check  
10 these things. So why model it?

11 I mean, basically, you have to say that in this  
12 period we know they got contaminated water. At this  
13 period, we know they didn't get it. And this period, we  
14 just aren't sure and we just can't do it. And running a  
15 model with wild guesses in it isn't going to make it any  
16 better is the point, back to this chart here I did  
17 yesterday.

18 DR. BOVE: I don't know if this is pertinent to  
19 what's being raised here, but my main concern right now  
20 and the problem with the previous study was that we called  
21 some people, a lot of people, unexposed when they were  
22 really exposed. Is that right? Yeah.

23 And if you look at the chart I produced, sensitivity,  
24 which means correctly calling someone who is exposed --  
25 who truly is exposed, exposed, and not calling them

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1 unexposed is a -- has a bigger impact than specificity of  
2 exposure, correctly identifying the unexposed.

3 So I'm more concerned right now with being able to  
4 say that these people -- certain proportion of the  
5 population were unexposed and being confident of that  
6 because that was the problem with the last study. And if  
7 there are interconnections, we need to figure out how to  
8 deal with that in our study. So, I mean, you know, I mean  
9 the simplest analysis we can make in our study is simply,  
10 as I said before, unexposed versus exposed and being  
11 confident that we're identifying the people properly.  
12 Okay.

13 Then, after that, we can talk about the level of  
14 concentration and if we have the numbers. Part of the  
15 constraints of our study is we have small numbers. You  
16 saw the number of cases that we have to deal with. This  
17 is not a large population.

18 In order to do a birth-defect study, I studied 80,000  
19 births in northern New Jersey, and I still didn't have  
20 enough really to -- I had small sample sizes when you  
21 broke -- started breaking them down into exposure  
22 categories. So this is -- you can't go too far in  
23 categorizing the exposure before you really have very  
24 unstable estimates for the relative risk or odds ratio.  
25 So -- is this --

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1 DR. DOUGHERTY: So to summarize and prioritize, we  
2 don't need to worry about the exposures at Tarawa Terrace  
3 because we can pretty well guess they're all exposed.

4 DR. BOVE: Except for that period; right? The later  
5 period? Right.

6 DR. DOUGHERTY: So we have -- I think we heard pretty  
7 significant evidence that pumps were operating through the  
8 entire study period out of Tarawa Terrace.

9 DR. WALSKI: Until they shut T-26 down.

10 MR. MASLIA: Yes.

11 DR. WALSKI: But until that date; yeah.

12 DR. DOUGHERTY: Possibly. We don't know the level of  
13 concentrations at other wells. TT-25, for example, is  
14 very close to TT-26, and it continued to operate, as I  
15 understand, at least into '86 or '87. So what we're --  
16 the real issue is worrying about the controls rather than  
17 the cases. And that gets us out of Tarawa Terrace. Is  
18 that fair?

19 DR. BOVE: Cases and controls is not the way that I  
20 look at it. Exposed and unexposed -- we need to identify  
21 who's exposed and not exposed.

22 DR. DOUGHERTY: Replace my language.

23 DR. BOVE: Right.

24 DR. DOUGHERTY: And then, is that a fair summary, a  
25 first-order priority?

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1 MR. MASLIA: Yes. Yes.

2 DR. DOUGHERTY: Okay.

3 DR. LABOLLE: And that falls on -- on this connection  
4 between Hadnot Point, I presume, and the Holcomb Boulevard  
5 system, essentially, because the potential for an  
6 unexposed population here is Berkeley Manor; is that  
7 correct?

8 DR. DOUGHERTY: What's Berkeley Manor?

9 DR. LABOLLE: Well, I'm looking at this development  
10 here, fed by the Holcomb Boulevard --

11 MR. MASLIA: Yeah. All the housing that would be  
12 served by Holcomb Boulevard.

13 DR. DOUGHERTY: That's very helpful.

14 MR. HARDING: Now, let me just point out that on 5  
15 February 1985, somebody sampled somewhere in the Tarawa  
16 Terrace system and reports 80 parts per billion of PCE,  
17 similar to the sampling that was done in 1982.

18 So, I mean, the whole system, if you just look at  
19 these snapshots -- and we don't know what time of day,  
20 what day of the week, what the circumstances were, which  
21 wells were cycling. But it looks remarkably stable  
22 through that period. It looks to me like even into 1985  
23 you could -- it would be reasonable to think that the  
24 people in Tarawa Terrace were all -- I want to make a  
25 nomenclature suggestion here -- potentially exposed, in

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1 the sense that the concentrations were available at their  
2 tap, should they choose to turn it on.

3 So it's a potential exposure. The actual exposure  
4 occurs when they drink it, they take a shower, they bathe  
5 in it. So they may have had personal habits that they  
6 drank nothing but bottled water. They may have had --  
7 they may have bathed rather than showered, which would  
8 make a big difference in how much they actually -- how  
9 much their intakes were. So we have to bear that in mind.

10 But the -- potentially, that population up there that  
11 lived there, if they used the water somehow, then had an  
12 exposure, had an intake. So in that whole area, up  
13 through 19 -- through at least, it would seem, February of  
14 1985.

15 MR. MASLIA: Would it be then your suggestion or  
16 advice to just use that 80 parts per billion?

17 MR. HARDING: No. No. That would not be my advice.

18 MR. MASLIA: Okay. Then what -- then our question  
19 would be --

20 MR. HARDING: I'm going to defer to the groundwater  
21 people.

22 MR. MASLIA: -- is what number do we use?

23 MR. HARDING: But let me make -- the point is that  
24 the water-distribution system is not a substantial factor  
25 in what that concentration is. It's the groundwater.

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1 It's reconstructing the historical conditions in the  
2 groundwater and then how the wells were cycled because if  
3 you had a contaminated well that was used, you know, once  
4 -- one day a month it's going to be real different than if  
5 that well was running all the time. So you -- we have to  
6 understand that. But the pipes, it seems to me, and --

7 MR. MASLIA: Would you not want -- let me -- let me  
8 -- again, so I understand or at least your approach or  
9 your understanding is, if we've got three, four wells, one  
10 of them is contaminated or whatever and they're mixing.  
11 Number one, you're suggesting that we use a simple mixing  
12 model. In other words, you pump groundwater however,  
13 assuming we get the information on how they're cycling.  
14 Then they're -- you use a simple mixing model, and then  
15 assume that that mixed mass was distributed equally to  
16 everyone in Tarawa Terrace.

17 DR. LABOLLE: Yes. That's correct. During the time  
18 when the systems were not connected.

19 DR. DOUGHERTY: Right. And to come back to the  
20 question that you asked Ben and Ben deferred on, it  
21 sounded like the first-order question was potentially  
22 exposed or certainly not exposed and that we don't care  
23 about concentrations for.

24 So the first priority out of that list that was given  
25 to us by Dr. Bove checked off. The second one -- it seems

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1 to me -- to come back to the end of the day yesterday, all  
2 of the focus should be on the source-release model.  
3 That's where the focus has to be. And the attention to  
4 how much at which well. That will fall out quite easily.

5 The hard part is the source term. And so you get the  
6 source, and in a relatively simple mixing model, if we  
7 need to get the second stage of concentrations, and the  
8 first-order estimates based on observed data are that the  
9 concentrations are stable, but that's only at the very  
10 back of the -- at the very back of the study period. So  
11 then we have to do the census work and precipitate perhaps  
12 more -- careful analysis of precipitation-induced  
13 accretion to get concentrations into the ground. But, you  
14 know, it really -- the comments this morning were quite  
15 helpful.

16 DR. LABOLLE: What source are you referring to?

17 DR. DOUGHERTY: ABC.

18 DR. LABOLLE: Okay. The ABC source itself.

19 DR. DOUGHERTY: For handling -- for handling the  
20 Tarawa Terrace problem.

21 DR. LABOLLE: I think, also, as important, in my  
22 experience, will be not just the source but the geologic  
23 uncertainty. For a given source, different geologic  
24 models can yield orders of magnitude, several orders of  
25 magnitude difference in arrival concentrations to a well.

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1 And that's the kind of uncertainty that you'd be dealing  
2 with there. I mean, granted, we see a few concentrations  
3 here at points in time that make this system appear as if  
4 it's stable. But then again, we've only got --

5 MR. HARDING: Two.

6 DR. LABOLLE: So, that -- there's, you know --

7 MR. HARDING: I understand.

8 DR. LABOLLE: -- there's not a lot to go with there  
9 to assume stability in the concentration. My experience  
10 has been that there's a lot of variability in the arrival  
11 to wells based upon their cycling and how the systems are  
12 run and variation in the source as David had mentioned,  
13 so...

14 DR. KONIKOW: But the point -- one of the points is  
15 that you really -- your study isn't starting until 1965 --

16 MR. MASLIA: '68.

17 DR. KONIKOW: '68. That gives you 14 years from the  
18 time ABC Cleaner [sic] started. So the value in doing the  
19 groundwater flow and transport model will be to, you know,  
20 start the -- as best we know, they were introducing  
21 contaminants into the soil, at least, through the septic  
22 tanks very shortly after they started; maybe a year, maybe  
23 instantly, maybe a year, maybe two years at most.

24 That gives you 12 years for it to reach the water  
25 table and spread. The groundwater flow and transport

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1 models, accounting for uncertainty, heterogeneity, and so  
2 on, will give you range of arrival times. But I'm  
3 guessing that the bulk of your realizations will get  
4 contaminant reaching the wells in that 14-year period.

5 MR. MASLIA: Oh, no question about it.

6 DR. KONIKOW: I think all of the uncertainty is going  
7 to be the range --

8 MR. MASLIA: Right; range.

9 DR. KONIKOW: -- is going to be before your 1968  
10 starting time. So it's worth doing those flow and  
11 transport models just to demonstrate that, but I --

12 MR. MASLIA: Let me, again, and I'm not -- I don't  
13 want this to come out right [sic] that I'm questioning the  
14 panel. But I'm questioning you because we're, from what I  
15 gather, at a critical juncture as to how we progress or  
16 what direction we take. So I want to make sure, both for  
17 the record and for my understanding, that -- and based on  
18 what you said, Lenny, and some others.

19 It's your suggestion then that more of the effort now  
20 be focused on understanding the groundwater flow and  
21 transport, in fact, from the source characterization  
22 through any unsaturated zone to get to arrive at a -- or a  
23 reduced level of uncertainty for the concentration that  
24 goes into the treatment plant. Is that --

25 DR. KONIKOW: Well, you have very limited data

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1       against which to calibrate your model. Okay. And you  
2       know, in the period that you were collecting data, the  
3       wells were contaminated. Okay. So if you're going to run  
4       the groundwater model, it's a question of how do you get  
5       from zero to that level of concentration that you're  
6       calibrating. You start with an initial condition of no  
7       PCE in 1954. Okay.

8               And then you start your model running. And there's  
9       going to be speculation upon assumption built into that,  
10      and you'll get a range of responses. My hypothesis or my  
11      guess would be that all roads will lead to contamination  
12      by 1968. You want to do the modeling to demonstrate it.  
13      Maybe I'm wrong.

14             But you want -- the only possible outcome that would  
15      differ would be a later arrival, and that may be the first  
16      few years there's no exposure. I think that's unlikely,  
17      but that's what you want to evaluate, and that's probably  
18      the best you could hope from from all of these models.

19             MR. MASLIA: Would you look at then perhaps putting  
20      some effort into different source characterization or  
21      operation, a continuous source versus pulsing versus  
22      operation five days a week versus seven days a week?

23             DR. KONIKOW: I don't see the point of doing that. I  
24      mean, the only -- the only possible testing, in terms of  
25      field testing, that might be worthwhile would be a tracer

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1 test to get a handle on travel time in this saturated  
2 zone. But I would explore other -- apparently, there were  
3 tracer tests done in the Tarawa Terrace area specifically  
4 related to ABC Cleaners. And this comes out of a draft, a  
5 National Research Council report that I saw.

6 And they say tracer tests were done there, interwell  
7 tracer tests were done there. I don't know what distance  
8 the wells were apart. And I don't exactly what the  
9 purpose was, but there is some -- somewhere out there is  
10 some information, and it would probably be useful to get  
11 that. That might help pin down porosity, dispersivity,  
12 and travel time.

13 MR. MASLIA: Okay. We'll look for that information.

14 DR. KONIKOW: But I'm guessing the outcome is still  
15 going to be, from the start of your epidemiological study  
16 to the end, Tarawa Terrace residents were exposed, which,  
17 if you could support that, it kind of mediates the need  
18 for more refined modeling because it's not going to yield  
19 anything more than that.

20 MR. MASLIA: Then from a standpoint of being  
21 conservative, from a public health standpoint, let's  
22 assume we refine our groundwater understanding and we get  
23 it -- get the simple mixing model and get it at whatever  
24 concentration we happen to simulate going in. The fact  
25 that we may or may not come out with the 80 parts per

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1 billion that was measured at the tap, is that immaterial  
2 or is that of importance or should we go -- again,  
3 supposing we come out with several hundred parts per  
4 billion after that?

5 MR. HARDING: The 80 parts per billion, these are  
6 five snapshots that we don't -- and first of all, we don't  
7 know the sampling protocols, what time of day, what day of  
8 the week, what the conditions were in the system. These  
9 are just snapshots.

10 MR. MASLIA: Right.

11 MR. HARDING: So, I mean, in between those, it could  
12 be 500; it could be two. You don't know. But the point  
13 here is: After you've done the groundwater modeling,  
14 you've got a one or a zero here on the breakthrough curve  
15 having reached a particular well. You still have the  
16 question -- and since I'm in the water-distribution  
17 business, at least at this panel, I want to make sure we  
18 still have a toehold on this; and that is, how the wells  
19 were run.

20 You know, there's still this operational question of  
21 how they cycled the wells. And if you had -- if I recall  
22 correctly, there was a couple of these, two or three wells  
23 -- groundwater people can may remember better -- that were  
24 really contaminated at Tarawa Terrace. And then there  
25 were several others that were still in operation. So

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1       they'd cycle through these.

2               So the concentrations were going to vary  
3       considerably, depending on which well happened to be in  
4       service at a particular point in time. And so personally,  
5       right now, based on what I know, I would spend a lot of  
6       time, in addition to dealing with the groundwater issue,  
7       on trying to understand at least statistically how these  
8       wells were operated, getting the statistics of those well  
9       operations so you can -- you can do some kind of a  
10      calculation of the probability that any particular person  
11      was exposed at a particular time. And I have to say right  
12      now that a weekly time resolution is probably  
13      unreasonable.

14             You know, I just -- you know, the groundwater -- I  
15      don't know. Once it's there, the well's going to be  
16      contaminated, but how they ran the wells on a particular  
17      day is unknown and probably will never be really known.

18             DR. BOVE: Right. And I was talking to Bob Faye just  
19      a few minutes ago over there, and at the wellhead, we'll  
20      have issues of seasonality; right? I mean, there will be  
21      differences in recharge, so that I'd like to capture  
22      because, you know, that will impact -- if we can  
23      categorize exposure more than just yes/no, it will be  
24      important to know whether the first trimester occurred at  
25      a time of high recharge or low recharge. That would be

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1           important.

2           MR. HARDING: I don't think the recharge is going to  
3           be as big an influence as to which switch on the wall has  
4           been flipped.

5           DR. BOVE: No. There's two --

6           MR. HARDING: Well --

7           DR. BOVE: Right. There's two, you know, general  
8           sources of uncertainty here, and I'm just focusing on --

9           MR. HARDING: You ought to pick the biggest one to  
10          deal with. Spend most your effort on the biggest --

11          DR. BOVE: Well, we have a couple of issues here too  
12          because we may have to do additional studies. Okay. So  
13          we would like to know when that contamination actually got  
14          to Tarawa Terrace. So that's why the modeling has to  
15          happen, so that we know exactly when that water got there  
16          because, if we have do to adult cancer study, for example  
17          -- and that's probably going to be recommended -- that we  
18          have a notion of how far back in time the exposure --

19          MR. HARDING: Prior to 1968?

20          DR. BOVE: Prior to 1968. Yes; absolutely. So  
21          that's why it's important to do the groundwater modeling  
22          and then determine that. But beyond that, as Bob was  
23          telling me, there's variability at the wellhead, which we  
24          have to capture. And then there's variability in the  
25          system, which you're pointing out, which we have to

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1 capture.

2 Now, whether -- I just threw out weekly. I'm willing  
3 to -- at this point, I'm willing to take what I can get.  
4 That's what environmental epidemiologists do all the time.  
5 So if monthly is the best resolution that makes any sense,  
6 we can work with that.

7 DR. LABOLLE: When you refer to resolution monthly,  
8 temporally, what if I told you that I can give you a range  
9 of monthly concentrations and they vary over two orders of  
10 magnitude?

11 DR. BOVE: It wouldn't be unusual.

12 UNIDENTIFIED PANELIST: For a medical epidemiologist.

13 MR. HARDING: Yeah; but neither is zero.

14 DR. WALSKI: The thing is you're going to know  
15 they're exposed. In Tarawa Terrace, you know they're  
16 going to be exposed from this time until they shut that  
17 well off. And after that, they're not exposed.

18 The real hairy issue is the Hadnot Point to Holcomb  
19 one. And I'm afraid there you're not going to get a: Yes,  
20 they're exposed; no, they're not. You're going to get:  
21 Yes, these people were exposed. No, those people were  
22 not. And there's a big chunk of people that we think may  
23 have not been, but there may have been a few days that  
24 they got it. And that's going to be a chunk of your  
25 population. You're not going to get a yes or no for those

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1 people because we just don't --

2 DR. BOVE: We have to whittle down that chunk because  
3 we're going to run out of --

4 DR. WALSKI: But that's going to be archaeology and  
5 not modeling. That's going to be finding out -- finding  
6 those people who retired who operated the valves and  
7 talking to them. And no amount of modeling is going to  
8 make up for that type of uncertainty.

9 DR. LABOLLE: Have you run the binary analysis  
10 already with the epi study? The one saying, you know,  
11 under the assumption that Tarawa Terrace is exposed during  
12 this --

13 DR. BOVE: That was the previous study. We said that  
14 everyone at Tarawa Terrace was exposed.

15 DR. LABOLLE: Uh-huh.

16 DR. BOVE: And everyone at Holcomb Boulevard was  
17 unexposed. And we left the Hadnot Point situation aside.  
18 And we've been challenged, rightly, that the study had  
19 exposure misclassification. The unexposed had a lot of  
20 exposed people in them because during -- at least '68 to  
21 '72, I don't know, they were getting Hadnot Point water,  
22 so they were hardly unexposed. And that really attenuates  
23 your odds ratio.

24 DR. LABOLLE: Couldn't you narrow that, your  
25 unexposed population, to a different time frame when they

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1           actually were unexposed?

2           DR. BOVE: We could. We were going to revisit that  
3           study after this effort was done. But we could do that,  
4           sure.

5           DR. JOHNSON: Well, this has been really an  
6           outstanding discussion, and at the risk of imposing upon  
7           Mr. Maslia once again, I -- would you -- would you put in  
8           a capsule statement what you think you've heard from the  
9           panel?

10          MR. MASLIA: Basically, as I think said 15 or so  
11          minutes ago, we need to -- my understanding is concentrate  
12          on the groundwater issues. And I'll just put that in the  
13          issues, including the modeling, the source, what I call  
14          source characterization, a source understanding, trying to  
15          either narrow or understand the uncertainties associated  
16          with the groundwater parameters, infiltration, recharge,  
17          things of that nature, well operation, cycling on and off  
18          of the groundwater wells, and then assume a simple mixing  
19          model at the plant and assume that's what the people in  
20          Tarawa Terrace were exposed to.

21          DR. JOHNSON: Is that what the panel think that you  
22          said?

23          DR. WALSKI: That's right for Tarawa Terrace.

24          MR. HARDING: In a summary, yes, for Tarawa Terrace.

25          DR. JOHNSON: Well, thank you. Let's move ahead.

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1 MR. MASLIA: Is there a need then to go over the  
2 present-day system, or...

3 DR. JOHNSON: Yes.

4 MR. MASLIA: Okay. Okay.

5 MR. HARDING: I think -- let's get back to this  
6 question here. We have an approach to establish an  
7 exposed population and within some range of uncertainty  
8 quantify those potential exposures and to calculate the  
9 intakes that resulted from that once we know what people  
10 did. That's the Tarawa Terrace area.

11 Now, I understand from the discussion that the second  
12 need now is to find an unexposed -- populations unexposed  
13 to the contaminants that had a similar lifestyle, you  
14 know, geographic location. So we're trying to find  
15 another population; right? That's our next -- that's our  
16 second need here; am I correct?

17 DR. BOVE: On the base; yeah.

18 MR. HARDING: On the base being important because we  
19 want them to have similar --

20 DR. BOVE: It's family housing, so they would be  
21 similar. It won't differ by -- too much by housing, and  
22 we can control for rank if necessary. We've done that  
23 before in a previous study.

24 MR. HARDING: Right. The reason I made that point of  
25 similar other exposures is we can't go off the base and

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1 find somebody -- some population. So we have to find some  
2 place --

3 DR. BOVE: Not for this study. Not for this study,  
4 we can't.

5 MR. HARDING: -- some place on that diagram, try to  
6 find some place where you can be reasonably certain people  
7 were not exposed for some certain period of time, right,  
8 specified period of time?

9 MR. MASLIA: Yes. And I do have, I guess, just  
10 another question to understand. Is it your suggestion or  
11 understanding then, and going back to Tarawa Terrace, that  
12 we would not need to know a diurnal pattern of any type  
13 over a 24-hour period as far as to refine periods when  
14 they did or did not most likely ingest water?

15 DR. CLARK: I think you would.

16 MR. MASLIA: We would need to?

17 DR. CLARK: That's my opinion. Yes.

18 MR. HARDING: You would only need it -- you would  
19 only need it to try to go back and reconstruct the well  
20 operation in my mind. Because once that water gets into  
21 the pipe system, assuming there's only one source, it's  
22 eventually going to reach every point in the system in a  
23 matter of -- if the tanks are really irrelevant, in a  
24 matter of hours. And the other -- most conditions. And  
25 maybe, if there's dead-ends, it will take a little longer.

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1           But the important part of potentially understanding  
2           water demand would be to go back and try to reconstruct  
3           how they cycled the wells because they might bring more  
4           wells on during the peak hours. They might not. If  
5           they're not using the tanks, that's probably what they're  
6           doing. I mean, there's only -- if they're not using the  
7           tanks then they're matching their supply and their demand  
8           quite well. Wouldn't you say, Tom? I mean, that's what  
9           you got --

10           DR. CLARK: I thought they were using the tanks. I  
11           thought that was part of what they found out from their  
12           study.

13           MR. MASLIA: Yes. They found out both -- both in  
14           different areas.

15           DR. WALSKI: We can't get rid of that uncertainty, so  
16           why try to model it? You know, depending on -- you know,  
17           Joe was operating the system in '91 and '92 and he did it  
18           this way. And Johnny came in '93 and did it this way.  
19           But back in '87, we had Frank did it and he did it this  
20           way. And we can't -- we're not going to be able ever to  
21           unravel that, I don't think.

22           MR. MASLIA: You're talking about operating the  
23           distribution system?

24           DR. WALSKI: Yeah; operating the well pumps. You  
25           know, we're not going to be able to unravel that it

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1 doesn't appear, other than saying on average from the  
2 USGS data we know they pumped this much out that year of  
3 the well. And that's about all -- that's the level of  
4 resolution we're going to have. So talking about  
5 hourly --

6 MR. HARDING: Monthly.

7 DR. WALSKI: Yeah. Okay. Monthly then. But  
8 talking about hourly is just -- we just can't get down to  
9 that resolution.

10 MR. HARDING: Do we have data for individual wells,  
11 production data for individual wells?

12 DR. CLARK: Monthly, I think, isn't it?

13 DR. DOUGHERTY: I believe you said yesterday it was  
14 monthly totals for the system.

15 MR. MASLIA: Yes.

16 DR. DOUGHERTY: And then we have snapshots in time of  
17 the individual --

18 MR. MASLIA: Yes.

19 DR. DOUGHERTY: -- well capacities from the Tarawa  
20 Terrace --

21 MR. MASLIA: We've got monthly totals.

22 DR. DOUGHERTY: -- capacities, not actual rates.

23 MR. MASLIA: We've got monthly production, raw-water  
24 intake for each of the treatment plants in the eighties.  
25 We're missing a couple of years.

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1 DR. LABOLLE: And some notes.

2 MR. MASLIA: And then we've got some notes on some  
3 other --

4 DR. UBER: Well, you have an understanding of their  
5 methodology of operation.

6 MR. MASLIA: Yes. Yes. We do have an understanding  
7 with also the understanding, although it may be  
8 qualitative, that they operated in a similar manner  
9 historically.

10 MR. HARDING: I don't want to sound frivolous here,  
11 but when going back and trying to figure out how people  
12 have run things in the past, I tend to look at their  
13 motivation individually. And in a public municipality  
14 kind of situation, that typically is cost.

15 So they'll typically try to run their most efficient  
16 resources first. They will get beat up by the city  
17 council or the utilities director to try to cut back on  
18 your costs. And I don't know what the motivating factors  
19 for the operators here were. But you have to ask that  
20 question if you're trying to go back and just come up with  
21 some hypothesis about how they operated, which may be the  
22 best you can do.

23 MR. MASLIA: Well, I can, perhaps, from what I've  
24 observed, or we've observed, one motivation would be to  
25 keep the tanks filled.

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1 MR. HARDING: Yeah. But at which wells would they --

2 MR. MASLIA: I'm saying --

3 MR. HARDING: You know, it may be that certain wells  
4 were maintenance problems. So they would not run those as  
5 often. It could be that they had a particular cycling  
6 scheme to avoid biofouling. I don't know. But these are  
7 the -- I'm not saying that we can determine that now.

8 But I'm just pointing out that when you go back  
9 you're going to interview people about how they ran this  
10 stuff. You're never going to know exactly. But you can  
11 refine that a little bit by saying: Well, they typically  
12 would run this well first because the switch was closer to  
13 the -- to the office. I don't know. They didn't have to  
14 walk as far. I mean, things like this happen.

15 DR. WALSKI: Well, we do have some evidence.  
16 Somewhere I read here that they ran several -- they ran  
17 each well several hours a day was their usual pattern. So  
18 we have at least that guidance that it was fairly uniform,  
19 that they didn't operate one for three months and then  
20 shut it off for three months.

21 MR. HARDING: Right.

22 DR. WALSKI: It was more -- you know, several hour  
23 cycles.

24 MR. HARDING: Right.

25 DR. WALSKI: So we know that the average, you know,

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1 contribution from each well over a day was fairly steady.  
2 It wasn't changing.

3 MR. HARDING: And that would be, certainly, one model  
4 to think about, you know, would be that they continued  
5 that operation, one scenario.

6 DR. CLARK: But back to the 24-hour exposure, I think  
7 you do. Particularly if you get into adult cancer studies  
8 and other epidemiological studies, you're going to have to  
9 have some sense of what people were exposed when. And it  
10 seems to me the only way to do that is to come up with  
11 some typical 24-hour cycles of exposure.

12 MR. MASLIA: That was our -- one of our motivations  
13 in trying to understand or at least get some system flows,  
14 present-day flows in the system. Now, that may or may not  
15 be --

16 MR. HARDING: But it doesn't -- that doesn't -- what  
17 matters is what goes into the system; that is, how they  
18 operated the wells, the cycling of the wells. That's what  
19 matters. Because once it gets into the system, that  
20 defines what the profile of exposure is going to be over  
21 the next several hours. If they're using the tanks, then  
22 it's going to get dampened out some way.

23 MR. MASLIA: But are you saying we do not need to  
24 know that -- and I'm just using throwing out numbers -- at  
25 4 a.m. there's an upswing in demand? So obviously, on the

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1 Marine Corps base, perhaps, because they're showering at  
2 4 a.m. And then it levels off, and then they come home,  
3 you know, at 4 p.m., and the upswing goes up. Are you  
4 saying -- it's my understanding that you're suggesting we  
5 don't need to know that.

6 MR. HARDING: Let's separate the two issues here.  
7 One is the behavior of the potential cases, the people  
8 that were exposed, from the operation of the system. And  
9 that information might be valuable in trying to figure out  
10 how they cycled the wells. But I would -- I would not.  
11 And I'm not an epidemiologist. But based on what work  
12 I've done related to this, I would not try to infer what  
13 people were doing from the water use of the entire system.

14 What I would do is try to look at the people, the  
15 individuals, to the extent that you can interview them or  
16 classify them, as to their behavior. And if you can't,  
17 then use population-default probabilities that they would  
18 shower at this time. If there's only one source, you're  
19 never going to know. No matter what, you're never going  
20 to know what happened at a particular hour. You won't.  
21 You can't know that. You can --

22 MR. MASLIA: You don't think we can know that because  
23 it's a specialized population on a military base?

24 MR. HARDING: I'm sorry. I was talking about the  
25 water-distribution system.

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1           MR. MASLIA: That's what I'm saying. In other words,  
2           when we've been on base anyway, at least our observation  
3           is that, as we're conducting field tests at 6 a.m.,  
4           they're all out jogging, doing exercises. Okay. So  
5           they're out of the house or out of their quarters at  
6           6 a.m.

7           If you look at some of our data, you see an upswing  
8           in production or whatever at 4 a.m. Well, that would seem  
9           to indicate somebody's using water from at 4 a.m. or using  
10          more water. Let me qualify that.

11          MR. HARDING: Well, I would hope you'd see it at  
12          about seven, you know --

13          MR. MASLIA: No.

14          MR. HARDING: -- when they come back from running.

15          MR. MASLIA: That's not what we've seen.

16          MR. HARDING: My point was that, in the water-  
17          distribution system, you won't know the concentrations to  
18          the hour. You just can't know that. The behavior of the  
19          people, you know, you may be able to infer that from other  
20          things you know. But I would not infer it from, at least  
21          solely from, the water pattern of water use in the system.  
22          That's all I'm saying.

23          DR. CLARK: But it's that combination of use and  
24          concentration that's important in terms of exposure.

25          MR. HARDING: Right. The concentrations represent

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1           what I call the potential exposures.

2           DR. LABOLLE: Are the concentrations important, or is  
3           it the total mass --

4           DR. CLARK I guess it depends on what you're looking  
5           -- I guess if you're looking as adult cancer exposure, I  
6           would think the concentrations would be important.

7           UNIDENTIFIED AUDIENCE MEMBER: We'd like to have  
8           that.

9           DR. CLARK: Every epidemiologist would like to have  
10          that, I would think.

11          MR. HARDING: Yeah. What Eric is saying is that it's  
12          the actual mass that enters the body that matters  
13          medically, and so it's a combination.

14          DR. DOUGHERTY: That depends upon the contaminant.

15          MR. HARDING: The drinking and the -- their behavior  
16          because if the water is at the tap and they don't use it,  
17          it doesn't --

18          MR. MASLIA: That's what I'm asking. Not to belabor  
19          the point, but I'm trying to understand. If we're saying  
20          we want to understand their behavior, short of having  
21          activity patterns, would not a surrogate for that be the  
22          development, based on data of diurnal patterns for  
23          different locations within the base, knowing -- knowing  
24          that they -- that you've got a specialized population  
25          here. In other words, you've got --

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1 DR. KONIKOW: But is there any hope if you knew the  
2 concentration at every well at all times, which you're not  
3 going to? But if you did, even given that information, do  
4 you know enough about when each well was pumped during the  
5 day, how it connected to the distribution system, to the  
6 treatment plant, to the tanks, that you could then predict  
7 what the concentration distribution within the residential  
8 area would be and how it varied with time on an hourly  
9 basis? That's just --

10 MR. MASLIA: No. That, we do not have.

11 DR. KONIKOW: I mean, it just seems hopeless to try  
12 to get hourly exposure data.

13 DR. CLARK: But you could get typical exposure  
14 patterns.

15 DR. WALSKI: But they're getting the same  
16 concentration every hour. So the pattern doesn't really  
17 matter.

18 UNIDENTIFIED PANELIST: Right.

19 DR. CLARK: Well, it is important. I don't  
20 understand your --

21 DR. WALSKI: If you're getting 80 in the morning or  
22 80 at night, that's not the distribution system.

23 COURT REPORTER: I need you by the mike; one at a  
24 time, by the mike.

25 DR. WALSKI: Okay. But that's not something you

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1 model. I mean, the model can -- let's say you get 80  
2 during that day, and that's into the epidemiology whether  
3 they drank it in the morning or drank it at night.

4 DR. CLARK: Well, it would depend on whether you're  
5 using it -- you know, whether you're inhaling it, whether  
6 you're ingesting it. I mean, those are very important.

7 DR. CLARK: Yeah, those are things are exposure  
8 patterns and you have to be able to have that kind of  
9 information. I think you could get that from a daily  
10 exposure -- a daily cycle of concentration plus  
11 superimposing upon that the pattern of activity.

12 DR. KONIKOW: Where are you going to get a daily  
13 cycle of concentration from?

14 UNIDENTIFIED PANELIST: We're not going to get that.

15 DR. CLARK: I think you can get a typical daily  
16 cycle.

17 UNIDENTIFIED PANELIST: I don't believe --

18 UNIDENTIFIED PANELIST: Where? Where would the  
19 variation come from?

20 DR. CLARK: I believe you can.

21 UNIDENTIFIED PANELIST: But it goes through the same  
22 place.

23 UNIDENTIFIED PANELIST: But you don't know that.

24 COURT REPORTER: Gentlemen (laughter).

25 UNIDENTIFIED PANELIST: Is she a Marine?

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1 COURT REPORTER: The record is suffering, and you're  
2 not getting anything right now. This is for your advice.

3 DR. SINGH: I think we are playing a little bit of a  
4 pundit here. I think the main issue is the water-  
5 distribution modeling system here and how does it affect  
6 the exposure. That is really the crux of the matter here.  
7 That's what he's trying to get at. And as Ben pointed  
8 out, as Tom pointed out, I don't think it is really going  
9 to make a whole lot of difference so long as we know the  
10 concentration and the depth because that is what is going  
11 to determine the exposure of the people.

12 DR. CLARK: But you have to -- I think you have to  
13 have the modeling to be able to predict what the  
14 concentration of the tap is going to be.

15 DR. SINGH: Well, I'm not sure really if the water-  
16 distribution modeling is going to make that much of a  
17 difference to the concentration. I think what we need --  
18 you know, what the groundwater model is giving, that is  
19 really the crux of the matter. Once that -- that gives us  
20 -- once it goes into the treatment plant, the water comes  
21 into the pipes. I don't think the pipes are going to make  
22 a great deal of difference unless, of course, as you  
23 pointed out, unless we take care of the biology and the  
24 chemistry, which they are not --

25 DR. LABOLLE: Well, that would be another issue.

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1 DR. SINGH: -- which they're not dealing with. Then  
2 I'm not sure how it is going to really greatly impact the  
3 pollutant concentration which the people will be exposed  
4 to.

5 MR. MASLIA: The fact that -- given that we may not  
6 be able to show a difference, you know, day to day or  
7 whatever, but rather just come up with a typical day, do  
8 we still need to be able to demonstrate that it is  
9 insensitive in a formalized way, not just make a  
10 statement, but demonstrate in a formalized, approved, or  
11 acceptable method, i.e., some kind of model or something,  
12 at least running it to some degree to show that this is  
13 insensitive and that there's no need to refine it any  
14 further?

15 DR. SINGH: Your snapshot data, on May 27th, 1982,  
16 tap water at TT tested: PCE, 80 ppb. Then if you take in  
17 the snapshot, February 5, 1985, TT tap water tested: PCB,  
18 80 mpb. And in between, there is a little bit of  
19 variation. It seems to me that really that it's not a  
20 very wide range of PCE concentration in the water-  
21 distribution system.

22 DR. LABOLLE: It's likely to vary more than, I think,  
23 what's indicated by these two snapshots. That's just --

24 DR. BOVE: Probably an order of magnitude.

25 DR. LABOLLE: Maybe more; maybe less.

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1 DR. POMMERENK: It's just -- for example, wasn't  
2 there a sample point that indicated 12,000 micrograms per  
3 liter?

4 MR. MASLIA: At a well?

5 DR. POMMERENK: At a well.

6 MR. MASLIA: At a well, there was 1600 -- almost 1600  
7 parts per billion.

8 DR. POMMERENK: So hypothetically --

9 MR. MASLIA: Was that Well 26?

10 UNIDENTIFIED AUDIENCE MEMBER: (Off microphone)

11 MR. MASLIA: Well 26 was almost 1600 parts per  
12 billion?

13 UNIDENTIFIED AUDIENCE MEMBER: Uh-huh.

14 MR. MASLIA: Yeah; 1600 parts per billion.

15 DR. POMMERENK: Hypothetically, you know, the well  
16 could have been turned on in the morning before any other  
17 well was turned on, and that got into the tank. And let's  
18 say we had some, you know, plug flow there. So the slug  
19 of 16,000 -- 1600 micrograms per liter could have reached  
20 some consumer within hours or a day. So there is a range  
21 of, you know, a factor --

22 DR. DOUGHERTY: What if it proved less than that  
23 because it takes multiple wells to fulfill the demand?  
24 Right? Let's say --

25 DR. POMMERENK: Well, I mean if we assume --

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1 DR. DOUGHERTY: -- three, roughly three at a time, I  
2 think, is what we discussed yesterday.

3 DR. POMMERENK: Well, if we assume that there's  
4 always complete mixing and so on. And, of course, there  
5 are reserves in the system. So they may draw some water  
6 from tanks once in a while, and so...

7 DR. LABOLLE: But, certainly, that concentration in  
8 that well, you know, although we see, you know, a point in  
9 time 1600. It could have been 16,000, you know, the month  
10 before.

11 DR. JOHNSON: Mr. Ensminger, do you wish to comment?

12 MR. ENSMINGER: Let me get up here before I get  
13 yelled at (laughter).

14 There was one test at Tarawa Terrace that did show  
15 215 parts per billion. And that was taken in February of  
16 1985, just prior to the wells being closed down.

17 MR. HARDING: Was that a test at a well?

18 MR. ENSMINGER: Yes. And it's in the public health  
19 assessment -- no; not at the well. That's at the tap.

20 MR. HARDING: What was that number again?

21 MR. ENSMINGER: 215. And it's in the public health  
22 assessment.

23 DR. JOHNSON: I'd like to -- I've been getting sort  
24 of a frantic message here from our recorder that she needs  
25 to calibrate her recording equipment. So I'd like for us

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1 to take about a ten-minute break. We can return and  
2 continue this discussion. And I would like to talk with  
3 Mr. Maslia as to what you feel you need to present next,  
4 if anything. Okay. So about a ten-minute break.

5 (Whereupon, a recess of approximately seven minutes  
6 was taken.)

7 DR. JOHNSON: About how much time will you need,  
8 Morris?

9 MR. MASLIA: Three years (laughter).

10 DR. JOHNSON: And more.

11 MR. MASLIA: No; probably 20 minutes, maybe. Is that  
12 too much?

13 DR. JOHNSON: We'll give you 15 minutes. Okay?

14 MR. MASLIA: Okay. I'll --

15 DR. JOHNSON: So about ten after --

16 MR. MASLIA: Okay.

17 DR. JOHNSON: -- try to wrap it up. And then we can  
18 turn to these questions.

19 MR. MASLIA: Okay.

20 DR. JOHNSON: I'm obsessed by these questions, as you  
21 can tell.

22 MR. MASLIA: That's fine. I appreciate that. What  
23 the presentation, continuing from this morning is intended  
24 to be, is to go over what we understand about the present-  
25 day system. So I'll proceed along that road.

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1           This is an example of the Hadnot Point water-  
2           treatment plant. Does anybody mind if I stand out here?  
3           Okay. But basically our approach is not to model anything  
4           within the treatment plant but basically the flow or the  
5           discharge coming out, the assumption being that nothing  
6           significant would occur to the -- once the wells are mixed  
7           to the concentrations within the treatment plant.

8           So what we have from a link and node point of view is  
9           we're just supplying water at a node or at a point to the  
10          distribution model and putting in demands and having our  
11          tanks. That's the approach in all three models that we  
12          have. And this information we obtained from the water  
13          utility or from records that we have -- production records  
14          that we have.

15          MR. HARDING: How complete are those?

16          MR. MASLIA: We have -- as Bob said yesterday, we've  
17          got records in the eighties, except for a couple of years,  
18          a couple of critical years. We've got sporadic  
19          information, and then we also have some in the nineties.

20          This is monthly data for each of the -- it's  
21          production for the total treatment plant, in other words,  
22          not by well, but by what the -- the plant took in as raw  
23          water and then produced and put out into the system and  
24          then what we measured in the field.

25          Each system is operated -- each of the three systems

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1 is operated by using what's referred to as a controlling  
2 tank. That's the one with the asterisk. And based on the  
3 water level in that tank, that triggers high-lift pumps to  
4 push water out into the system or fill the tanks.

5 We've done some C-factor tests. The -- this is an  
6 average of all. We did eight C-factor tests. These are  
7 the averages. The ones where it says "C-factor tests" is  
8 an average of the tests for that particular pipe type. We  
9 found that the cast iron pipes had a -- what we thought  
10 indicated more of a smooth as opposed to more rough type  
11 characteristic in them.

12 DR. WALSKI: Morris, roughly what percentage of the  
13 pipe was cast iron versus PVC? I guess they're the two  
14 main ones.

15 MR. MASLIA: I have that, and that's in the notes.

16 DR. WALSKI: Just approximately. Was it like half  
17 was cast iron or 10 percent or...

18 MR. MASLIA: I want to say 60 percent, but I'm not --  
19 it's in the report, and I don't have that off the top of  
20 my head. But we've got a table. There was a table in the  
21 report that listed it, but we can get you that number.

22 DR. WALSKI: Okay.

23 MR. MASLIA: Cast iron; yes. It's 34 percent cast  
24 iron.

25 DR. WALSKI: Okay.

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1 MR. MASLIA: That's present day --

2 DR. WALSKI: Okay.

3 MR. MASLIA: -- present-day system. We've also  
4 distributed or developed what we're calling demand groups,  
5 and this is based on these group -- groupings are based on  
6 nomenclature from a water-conservation analysis that was  
7 done in 1999 for the Marine Corps at Camp Lejeune.

8 And we've got this unknown negligible group basically  
9 because there was a large disparity between what could be  
10 accounted for and what couldn't be. It's about 30 percent  
11 difference.

12 Just to show you the distribution based on our  
13 understanding. This is Hadnot Point, and you can see in  
14 the Hadnot Point -- and I know -- I apologize, Ben, that  
15 this is in color. So let me get a -- I'm trying to think  
16 where I put the pointer now.

17 DR. JOHNSON: Use the microphone. I was referring to  
18 Ben.

19 MR. HARDING: Sorry.

20 MR. MASLIA: Okay. Ben, Hadnot Point -- this is  
21 really the only family housing right up in this area. The  
22 area down in here is bachelor housing. And then the rest  
23 would be more industrial and other offices and things like  
24 that; whereas, in Holcomb Boulevard and Tarawa Terrace --  
25 in Holcomb Boulevard, we've got all this area down here,

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1 down here, and down here. That's family housing. And, of  
2 course, in Tarawa Terrace, we've got -- that's nearly 100  
3 percent family housing with the exception of some shopping  
4 centers.

5 The number of nodes that it's referring to in the  
6 model is basically for in all pipes. These are all pipe  
7 models, although we have also developed the network for  
8 skeletonized ones as well. That is basically a short  
9 description of the present-day distribution systems, and  
10 now what I'll do is go through the field testing that  
11 we've done.

12 DR. CLARK: One question is: Do you have a picture of  
13 how pipe replacement took place over time? If it's 34  
14 percent cast iron now, one of the issues is going to be, I  
15 think, how much of it was cast iron under previous  
16 scenarios, I guess?

17 MR. MASLIA: Here's a picture of how it took place.

18 DR. CLARK: Yeah. And do you know how much, for  
19 example, in 1985, how much was cast iron?

20 MR. MASLIA: Not right offhand.

21 DR. CLARK: Okay.

22 MR. MASLIA: We don't. But we do know because right  
23 now they're replacing -- substantially replacing. They've  
24 got a building program, say, at Tarawa Terrace. And so  
25 they're, as we speak, replacing -- replacing pipes with

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1 PVC. On the other hand, they replaced a pipe going up to  
2 the Naval hospital. That's the asbestos cement pipe that  
3 we did a test on, and for whatever reason, when they  
4 replaced the pipe, they used asbestos cement not PVC.

5 So I'm -- for whatever reason, I don't know. I'm  
6 assuming that's the way the contract -- whoever bid on the  
7 contract replaced it with. Okay. Continuing on, we've  
8 conducted -- we conducted a test at -- in the Hadnot Point  
9 area from May 24th to 27th through monitored system  
10 pressures. We retrieved storage-tank levels and we  
11 conducted dual-tracer tests.

12 We injected calcium chloride, and then we also -- it  
13 says injected sodium fluoride. We shut the fluoride off  
14 to the -- we didn't shut it off. The utility people, at  
15 our request, shut the fluoride off. And they used a  
16 sodium fluoride gravity-feed system at both treatment  
17 plants.

18 Just some equipment that we used to monitor: pressure  
19 loggers. And these are the water-quality monitoring  
20 systems. There's a dual-probe system that's ion specific.  
21 In this case, it can measure fluoride and what we specify:  
22 fluoride and chloride and then conductivity in the other  
23 probe plus pH temperature. The single probe can measure  
24 conductivity and -- but is not ion specific.

25 This is the way we attached it in the field, putting

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1       them in some plastic housing and then strapping it to the  
2       hydrant and flowing the hydrant. And then we also  
3       obtained grab samples as well and did some QAQC on site  
4       as well as sending grab samples off to the federal  
5       occupational health lab in Chicago.

6               This map here shows the monitoring locations, and  
7       you've got that in the reports. We had 27 different  
8       monitoring locations for the Hadnot Point. We had nine  
9       pressure; nine dual-probe locations, where we did fluoride  
10      and chloride; and then nine, just conductivity locations.

11              As I said, pressure ranges basically between about 55  
12      and 65 PSI and fairly constant. And the topography is  
13      fairly flat there as well, which gives you very small  
14      hydraulic gradients. And realizing that, that was one of  
15      the reasons behind us doing tracer tests, as we felt we  
16      would not get any kind of unique calibration even on the  
17      present day just looking at hydraulics.

18              This is some -- I'm just going to show you some data  
19      from this test. This is injecting calcium chloride. This  
20      is at location F-02. The red line is a model simulation,  
21      and the -- or the solid line is a model simulation, and  
22      the dots are the data recovered by the logger. Here is  
23      an example -- this square box is the injection time and  
24      at location F-01, which is -- let's see where is -- on  
25      my map, it's at Hadnot Point, which is (off microphone) --

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1 COURT REPORTER: Microphone.

2 MR. MASLIA: Hadnot Point was located right over  
3 here. That's F-02. And, of course, what we found out  
4 that that's about a 20-hour lag and which greatly exceeded  
5 what we predicted in the model even though the model  
6 wasn't calibrated. And so we had thought there may have  
7 been some closed valves, and post-test auditing by the  
8 water utility, in fact, confirmed we had four closed  
9 valves.

10 And you've also got this drawing in the notebook that  
11 we gave you. But you can see right over here. Here was  
12 the source at the treatment plant. So we've got down here  
13 a couple of hour travel time, down in here, down to here  
14 about nine hours; but all the way up to here, between 20  
15 and 26 hours, right here. So that obviously shows the  
16 effect of the closed valves and low demand as well. So it  
17 just stayed in the system there.

18 This slide shows you the fluoride concentration in  
19 the tanks. We had requested that the utility shut the  
20 fluoride off on May 15th. The test took place the week of  
21 May 24th. And, in fact, water samples, taken by the  
22 utility within -- at the distribution-sampling point  
23 showed concentrations of fluoride down around between .1  
24 and .2, so it had diluted down.

25 But the concentrations in the tanks ranged between --

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1 almost averaged about one from these three tanks. This is  
2 the controlling tank right down here. So, of course, it's  
3 exchanging water back and forth. So it's getting the --  
4 it's diluting; whereas, these tanks over here really did  
5 not show much dilution.

6 This is an example of -- and it caught us by surprise  
7 when we -- in the beginning since we didn't understand how  
8 they were operating the tanks and that. Here is some grab  
9 sample data of the fluoride, and this is a logger that was  
10 near the French Creek tank, which is the controlling tank,  
11 which was this tank right over here.

12 And unfortunately, we had to pull the logger for  
13 technical reasons. But we still see the grab sample data  
14 rising and chloride concentration indicating a slug coming  
15 through here. And then 48 hours later, all of a sudden,  
16 we see a slug of -- we reconnected the logger, and we see  
17 a slug coming through.

18 And that is sort of what guided us and then in a  
19 subsequent test in instrumenting the tanks, putting  
20 loggers on the tanks and seeing that the water was not  
21 mixing completely in the tanks.

22 DR. WALSKI: When you say putting a logger in a tank,  
23 are you sampling the pipe going into the tank at ground  
24 level or are you taking sample from inside the tank and --

25 MR. MASLIA: Not from inside. We're putting it on

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1 the pipe. And we can see -- and I've got some data to  
2 show -- on a subsequent test, you can tell which is the  
3 system fluoride and which is the tank fluoride --

4 DR. WALSKI: Okay.

5 MR. MASLIA: -- by the spiking, by the spiking of the  
6 logger data, in other words, so you know what elsewhere in  
7 the system, what the fluoride level is. And then all of a  
8 sudden you see a high spike coming through the logger,  
9 which is interpreted to be the tank releasing water to the  
10 system. And that's when it's -- that's when you're  
11 shutting off the fluoride.

12 Just the opposite is true when you're increasing the  
13 fluoride in the system. You'll see low fluoride from the  
14 tank now going in the logger as opposed to higher fluoride  
15 from the system. And I'll show that in just a few  
16 minutes.

17 Okay. We conducted the hydraulic test in the week of  
18 August 25th. Again, this was to determine some C-factors,  
19 and we used sort of an innovative fire-flow testing  
20 technique where we opened up several -- several hydrants  
21 at the -- at different times. We found eight. I think we  
22 tested eight different sections of pipe. One of --  
23 because of the piping construction and layout, we were  
24 really trying to look at the -- get some information on  
25 the Hadnot Point area. But it was just not possible to

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1 find, say, a thousand-foot long section of pipe with three  
2 adjacent hydrants.

3 We scoured the maps and stuff and went out in the  
4 field, and that just was not a possibility. So we did do  
5 fire-flow tests in that area, but -- and for the C-factor  
6 test, we used a diffuser, and then we also used a pitot  
7 gauge for the fire-flow test in combination with this  
8 diffuser.

9 And this is actually from the summary I showed you  
10 before, the three C-factors. These are the actual values  
11 that came out, and they were pretty much -- as I said, on  
12 the average, they were within the literature published  
13 about values. For the fire-flow tests, what we did: We  
14 sort of modified the standard approach of putting a gauge  
15 on one hydrant and flowing the other. What we did is we  
16 used, in this case, two hydrants, flowing -- this is  
17 flowing Hydrant 1 here and Hydrant 2 there.

18 So we would have a static pressure, which you can see  
19 basically is about 50 to 53 psi on the observation  
20 hydrants. Then we flowed Hydrant 1, which would be this  
21 one, 773 gallons per minute. And you can see the pressure  
22 drop across all the hydrants. Then we flowed Hydrants 1  
23 and 2. So we'd flow this hydrant and that hydrant, and  
24 you'd see a further pressure drop right there.

25 So that's the total flow coming out. It was about

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1 1300 gallons per minutes. And then, of course, we shut  
2 off Hydrant 1 and only flowed Hydrant 2 and then go back  
3 to the static case. So that one came out very well, and  
4 that was to help us with calibration.

5 Finally, we conducted, based on our observation of  
6 what we saw in May with the Hadnot Point with the  
7 concentrations going -- or being delayed and coming in at  
8 a later time than we expected at the tanks, we thought we  
9 would instrument the controlling tanks.

10 So we had the water utility put some ports on the  
11 pipes leading to the storage tanks, and in this case, we  
12 had two controlling tanks. We had one at Paradise Point,  
13 which would be right over here. That's controlling --  
14 that's a controlling tank for the Hadnot Point water-  
15 distribution system. And then the Camp Johnson tank,  
16 which is the controlling tank for the Tarawa Terrace  
17 distribution system.

18 So again, based on the water level in those tanks,  
19 that's what triggers the high-lift pumps to turn on or not  
20 turn on. And I just -- I showed you there. We monitored  
21 the system. We used -- we've got nine of the loggers. So  
22 we monitored the fluoride. We shut off the fluoride and  
23 recorded as it was diluting.

24 And then we had the utility turn the fluoride back on  
25 and record the increase in fluoride. We did not do any

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1 injection on this test. And so, Tom, you were asking  
2 about the storage tanks. This is a picture of the  
3 Paradise Point storage tank, the piping. And right over  
4 here is piping going in and one coming out. And so our  
5 loggers attached right here and on the outside of the  
6 actual housing but -- so depending which way the water  
7 would go, we would either get inflow or outflow and be  
8 able to record the fluoride concentration in the logger.

9 DR. WALSKI: Is that one tap or two taps?

10 MR. MASLIA: That's two taps.

11 DR. WALSKI: It's two taps.

12 MR. MASLIA: Two taps.

13 COURT REPORTER: Microphone, please.

14 DR. WALSKI: Mike. Okay. It's two taps, but how do  
15 you know that you're not getting the old -- the wrong  
16 water, if you had two taps like that? That it's --

17 MR. MASLIA: If it's going -- if it's going in -- and  
18 I'm trying to remember. I think it goes in --

19 DR. WALSKI: Usually, it fills through the smaller  
20 one.

21 MR. MASLIA: Going in this way. Right. That's the  
22 smaller pipe, going in this way. Then when it comes out,  
23 it's going to come out that way.

24 DR. WALSKI: Okay. But some of the -- well, that's  
25 okay. It's probably a very minor thing. Don't worry.

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1 MR. MASLIA: So here are a couple of loggers. F-01  
2 is the source. That was put at the -- on the Venturi  
3 meter or near the Venturi meter at Holcomb Boulevard  
4 water-treatment plant. So that's essentially your source.

5 This dotted line here indicates when we shut the  
6 fluoride off, which was at 1600 hours on September 22nd.  
7 And then we turned it back on at 1200 hours on September  
8 29th. And Logger No. 3 was located down here. So Logger  
9 No. 1 is over here. Logger No. 3 is here. And you can  
10 sort of see the time it takes between here and here. So  
11 that's your -- you know, you could estimate an average  
12 travel time from there.

13 This is the example of the loggers connected to the  
14 controlling tanks. F-08 is the controlling tank at  
15 Paradise Point, which is this one over here. And F-09 is  
16 the Camp Johnson tank. That's basically the end of the  
17 distribution system as it is today. So, for example,  
18 right here, as the system water is being diluted, the  
19 system water -- and that's -- our grab samples show that  
20 too is down around .2.

21 So you've shut off the fluoride here, and by this  
22 time the system water is down about .2, but you're getting  
23 spikes of high -- high fluoride water, which is coming  
24 from what's in the tanks. Okay. And then just the  
25 opposite occurs when you're increasing the fluoride in the

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1 system. And, of course, this tank right here, being at  
2 the end of the system, shows a much more attenuated  
3 effect.

4 One of the issues we ran into and I believe we  
5 resolved -- but this line down here is the flow of water  
6 from the ground tank, the Tarawa Terrace ground tank. So  
7 if Camp Johnson tank is the controlling tank, when the  
8 Tarawa Terrace pumps come on and it's flowing water, we  
9 should see changes in the water level in the Camp Johnson  
10 tank. And the problem is, I believe, there was some SCADA  
11 and/or telemetry issues because Camp Johnson tank is flat-  
12 lining. If it's flat-lining, there should be no water  
13 flowing from the Tarawa Terrace.

14 DR. WALSKI: That's not flat. That's about what  
15 you'd --

16 DR. JOHNSON: Microphone. Mike; please.

17 DR. WALSKI: Okay. It's not going to drop  
18 dramatically because it takes a long time. So it dropped  
19 1 or 2 feet --

20 MR. MASLIA: Over here. This is flat. That's not  
21 dropping.

22 DR. WALSKI: Okay. From there, it's --

23 MR. MASLIA: Yeah. Yeah. Yeah.

24 DR. WALSKI: There are -- it is --

25 MR. MASLIA: No. No. No. I'm talking about right

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1 here.

2 DR. WALSKI: But there's some issues with SCADA, in  
3 that just the lag time that SCADA doesn't continuously  
4 monitor and you may miss.

5 MR. MASLIA: Right.

6 DR. WALSKI: So it's not unlikely to happen, what you  
7 see.

8 MR. MASLIA: Okay. Lack of -- lack of meter data.  
9 We were going with the concept of a district metering  
10 area. So, in other words, because we did not have -- or  
11 we do not have household meters, we were going to meter  
12 certain areas and then be able to come up with per capita  
13 demand in that area. Sixteen meters have been installed.  
14 And we've got eight in the Holcomb Boulevard and Tarawa  
15 Terrace area.

16 So, for example, say, in Berkeley Manor, by knowing  
17 the flows and from here, here, and here, we would be able  
18 to come up with a per capita estimate or quantity. And  
19 this, in fact, there's a paper that just came out in 2004,  
20 talking about that. I've got the reference some place.  
21 But basically, using this approach and then trying to  
22 quantify the stochastic nature of the demand. And that's  
23 in the Hadnot Point area, meters in the Hadnot Point area.  
24 And that's it, I think. Oh, five minutes early.

25 DR. JOHNSON: Thank you. Tom.

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1 DR. WALSKI: Well, the question about the metering  
2 now, you did full-pipe metering; right? You just tapped  
3 whatever size pipe was there?

4 MR. MASLIA: Yes.

5 DR. WALSKI: Did you check the model to see what the  
6 velocities were at those points?

7 MR. MASLIA: Actually, we've gotten into that issue,  
8 and we have done that now. I mean, we have that now.  
9 We've got an upflows. We've got flows. One of the issues  
10 that's been run into -- let me just put this up.

11 One of the issues that we have run into with the flow  
12 meters is the calibration process. And our understanding  
13 is from the vendor -- of course, these meters are  
14 Dynasonics, and they've got plus or minus 2 percent.

15 And the issue is at what magnitude -- if you  
16 calibrate it for a higher flow and then you're actually  
17 seeing a predominantly lower flow, you're going to have a  
18 much larger error than that. And just the opposite: If  
19 you're calibrating it for lower flow conditions and all of  
20 a sudden you flow hydrants or whatever, it's not going --  
21 so what we have done, we were just up there in March and  
22 based on seeing the attempt for calibration and seeing  
23 what we were running into -- and I can pass a couple of  
24 these around and just -- if anybody wants a full copy,  
25 then we'll just need to run it through our clearance

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1 people.

2 But this is meter by meter location. And we did use  
3 the models as they are right now. They're not calibrated,  
4 but we feel they're in the ballpark, in other words. And  
5 we did both a table basically giving minimum, average, and  
6 maximum simulated flows, pipe diameter and where they are,  
7 as well as within each meter giving calibration  
8 procedures. And then we also had graphs on some of them.  
9 Where hydrants were available, we'd flow that hydrant to  
10 change the flow, to check the calibration.

11 So we also did graphs. So when you go back out into  
12 the field to calibrate them, we could know what ranges of  
13 flows to expect. You know, basically whether you're  
14 looking at flows below 100 gallons per minute or upwards  
15 of 600 gallons per minute. So that's where we are with  
16 that. We haven't gone back out in the field to do that,  
17 but that's the next plan. I'll just pass one around.

18 (Passing document around)

19 MR. MASLIA: If the panel would actually like  
20 copies --

21 COURT REPORTER: Mike.

22 MR. MASLIA: If the panel would like copies, let us  
23 know and we'll run it off and get it to you.

24 DR. WALSKI: Okay. The issue I've run into in these  
25 kind of meters is that, typically, the flows in the normal

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1 distribution system are very low because the pipes are  
2 sized for fire flow and they're down less than a foot per  
3 second and these meters are really lousy at a foot per  
4 second.

5 I mean, no matter what you do, you're going to have a  
6 really bad range. Almost -- usually for this type of  
7 metering, you've got to go in with a smaller pipe; like if  
8 you have a 12-inch line, you put in an 8-inch spool piece  
9 or something like that to get the velocity higher so that  
10 you get something in a range where it's sensitive because,  
11 when you're down less than 1 foot per second, no matter  
12 what you do for calibration, they're just lousy for those  
13 ranges. So what velocities are you seeing in these pipes?

14 MR. MASLIA: Claudia, do we have those? We can get  
15 those for you.

16 MS. VALENZUELA: (Off microphone)

17 MR. MASLIA: Yeah; yeah. If you don't mind showing  
18 -- we'll pull that up for you, if that's okay.

19 DR. CLARK: We had some similar experiences in  
20 Cincinnati when we tried.

21 MR. MASLIA: Are you saying so put them in smaller  
22 diameter pipes or...

23 DR. WALSKI: Well, not so much putting them in  
24 smaller diameter pipes, but make the pipe down. Like, if  
25 you have a 12-inch pipe, you don't put in a -- just a

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1           12-inch meter. You put in an 8-inch meter so that the  
2           velocity is higher for a little while and you have -- but  
3           that's a lot more construction cost, unfortunately.

4           MR. MASLIA: Right.

5           DR. WALSKI: You want to just tap the pipe.

6           MR. MASLIA: Yes. They've just been tapped now, and  
7           they've been tapped into a variety of diameter pipes.  
8           I've got the diameters listed.

9           DR. WALSKI: Yeah. They range from 6 to 12. But in  
10          a 12-inch pipe, to get more than 1 foot per second, you've  
11          got to be really cranking the water through it.

12          MR. MASLIA: Yeah. In fact, we've got one -- well,  
13          actually that one's not going to be used. We had one in  
14          24-inch pipe, but that one's not being used. There's no  
15          flow in that one. Basically, the majority of them are  
16          12-inch pipes. We've got an 8-inch pipe and then a 16  
17          inch and a 10 inch.

18          DR. WALSKI: So you need almost -- excuse me. You  
19          need about 500 GPM in a 12-inch pipe to get sensible  
20          velocity.

21          MR. MASLIA: Yes. Yes. Yes. And --

22          DR. WALSKI: And in most of the data, you don't have  
23          that.

24          MR. MASLIA: And we've had to get that by flowing  
25          hydrants.

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1 DR. WALSKI: But then when you measure it, though,  
2 the actual flows you're measuring are going to be below --

3 MR. MASLIA: Right.

4 DR. WALSKI: -- the sensitivity of the gauge,  
5 unfortunately. So it's going to be an issue. So -- it's  
6 just going to be an issue when it comes up.

7 DR. JOHNSON: Please.

8 DR. UBER: Morris, I've just got a quick kind of a  
9 boring clarification question here. I was just looking at  
10 some of the hydraulic gradeline elevation in this Table 1.  
11 And is this -- this is probably just a typo or something,  
12 but the controlling tank in the Camp Johnson tank, which  
13 is, I guess, the controlling tank for Tarawa Terrace,  
14 that's indicated as having a hydraulic gradeline of 107,  
15 roughly. Is that wrong, or...

16 MR. MASLIA: Which table are you looking at?

17 DR. UBER: Table 1 of -- in the present day, right  
18 after the blue page in mine. The reason why I was asking  
19 for -- because I was trying to look at hydraulic  
20 gradelines between the different areas and that's -- you  
21 know, the controlling tank in Hadnot Point is 160, and in  
22 Holcomb Boulevard it's 151, and then this is 107. I can't  
23 imagine there's that kind of losses.

24 MR. MASLIA: Oh, that one.

25 DR. UBER: I assume that it's a mistake.

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1 MR. MASLIA: No. No.

2 DR. UBER: No. I guess I just don't understand how  
3 it operates then, but -- so -- well, if that's correct,  
4 see, there's another. The other tank in Tarawa Terrace,  
5 which is just, you know, a little ways away, has a  
6 hydraulic gradeline of -- well, 142 plus 32. So, you  
7 know, over 170 --

8 UNIDENTIFIED PANELIST: If you add that to that --

9 DR. UBER: We can't go from 170 to 107; can we?

10 DR. WALSKI: That's one of the things I pointed out  
11 in my comments too.

12 DR. UBER: Oh, did you?

13 DR. WALSKI: It looked inconsistent to me.

14 DR. UBER: Oh, okay. The only reason why I was  
15 asking is that -- I mean, if that were -- I was trying to  
16 figure out whether there is any -- any infrastructure  
17 information, having not been to this area or anything like  
18 that, to indicate likelihood of, if there were  
19 interconnections, what might be the possibilities of  
20 shipping water between them, you know, sizes of pumps,  
21 hydraulic gradeline, you know, that type of thing. And if  
22 that were true, that that's a controlling tank, it would  
23 seem to be hard to get water out of Tarawa Terrace --

24 MR. MASLIA: Is that just the tank level or the --

25 DR. UBER: Well, it's the hydraulic gradeline and the

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1           controlling "controlling tank."

2           MR. MASLIA: Joel, did you have or Brynn have any --

3           DR. JOHNSON: Come to a mike, please.

4           MR. ASHTON: Joel was just telling me -- that was our  
5 operator -- that the elevation difference between Tarawa  
6 Terrace and the Montford Point or Camp Johnson tank is  
7 about 7 feet.

8           MR. MASLIA: Seven feet.

9           DR. UBER: Okay. So there's a mistake there.

10          MR. ASHTON: There must be a mistake there, but  
11 there's about 7-foot elevation difference between the two.

12          DR. UBER: I don't want to belabor the point if it's  
13 a mistake. I assumed that it was, but -- okay.

14          DR. JOHNSON: Well, thank you for the comment. Do  
15 you have something else?

16          DR. WALSKI: Getting back to the graph that Claudia  
17 put up on the screen, you're going to have problems with  
18 that -- with these meters then. If the velocity is around  
19 .1 to .2, you're really down at the very low range of  
20 where that meter's good, unfortunately. If that's an  
21 average day kind of condition that she's got there, that  
22 doesn't bode well for accuracy, unfortunately.

23          DR. JOHNSON: Okay. Any further points?

24          DR. CLARK: Just a follow-up that we've even found  
25 some cases where we've got negative velocities when we

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1       knew that wasn't the case. So -- yeah -- at those local  
2       meters.

3               DR. JOHNSON: Morris, thank you for your  
4       presentation. Why don't you have a seat there at the  
5       table? And I would also ask Dr. Bove to join Mr. Maslia  
6       at the table. Let us turn to the set of questions and  
7       issues that the agency asked that you consider. And there  
8       is a revision to this, but the revision is being passed  
9       around.

10              The first question is -- and we've had some  
11       substantive discussion on this already, but...

12              Are the distribution-system tests conducted to date  
13       and the one planned for summer 2005 sufficient to provide  
14       ATSDR with required data for reliable calibration of  
15       present-day models?

16              Tom, would you like to take a lead on that?

17              DR. WALSKI: Yeah. It's outstanding. I mean, it's  
18       the best data study I've ever seen, probably. And it's  
19       probably more than they need for this study because you're  
20       not really doing fire-flow analyses. So you don't really  
21       need those high-flow tests. So, if anything, it's a  
22       little bit of overkill. But they did a great job.

23              DR. JOHNSON: Other comments from the panel?

24              DR. CLARK: That was my reaction too, that they're  
25       really kind of a state of the art of testing from what

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1 I've seen so far.

2 DR. JOHNSON: Turning to Question 2 then:  
3 Considering the lack of household-consumption data and  
4 diurnal-curve characteristics, will applying the "district  
5 metering area approach," using the 16 system flow meters,  
6 provide adequate and sufficient information to develop per  
7 capita consumption data and diurnal-curve characteristics?  
8 Are panel members aware of other approaches that could be  
9 useful?

10 DR. WALSKI: Well, the more rudimentary way to do it  
11 is just to do a mass balance on the system. You look at  
12 flow in, plus or minus changing tank levels, on an hour by  
13 hour basis. And that's usually good enough when you don't  
14 have submetering because, unfortunately, as I was saying  
15 here, the velocities are so low at those points that the  
16 accuracy of these gauges aren't going to be that good at  
17 those really low velocities. So just the mass-balance  
18 approach may be adequate.

19 MR. MASLIA: Can I ask a qualifying question? Do you  
20 not need to then have, you know, reliable SCADA  
21 information for that?

22 DR. WALSKI: Right. Yes.

23 MR. MASLIA: Okay. And --

24 DR. WALSKI: And that's --

25 MR. MASLIA: At least we've been informed that, you

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1 know, the SCADA equipment is old at Camp Lejeune. And,  
2 you know, at some points in time -- at least some times  
3 when we were testing the test, there is some question as  
4 to their reliability, that it doesn't have it. So that  
5 was one of the issues we had discussed with the folks at  
6 Lejeune is -- as to why we decided to go with a metering  
7 approach. So -- but you would need the reliable SCADA  
8 information then.

9 DR. WALSKI: Right. The question though is usually  
10 it's a lot cheaper to recalibrate the SCADA system than it  
11 is to put in all these meters and the vaults and all that.  
12 But that's something where I don't know the details. So I  
13 couldn't really say.

14 MR. MASLIA: Okay. I just wanted to clarify that.

15 MR. HARDING: I think we have to keep in mind the  
16 purpose for the estimates of water use. And I'm not  
17 completely clear on that. I think in Tarawa Terrace we've  
18 decided we probably don't need it, other than to deal with  
19 the well cycling. And in this particular circumstance, I  
20 -- now, it's referring specifically to the work at Hadnot  
21 Point; right?

22 It isn't clear to me that we're going to -- that a  
23 model is required at Hadnot Point if our second objective  
24 is to establish an unexposed population. So I think we  
25 just need to keep that in mind. But get -- if we do want

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1 to establish hourly or subdaily water-use characteristics  
2 at the water-treatment plant, then I think Tom's right,  
3 that it's much easier to measure tank levels and flows at  
4 the plant than it is out in the system.

5 DR. BOVE: Let me just say one thing. We do want to  
6 know who was exposed to TCE. So we do want to know not  
7 only who's unexposed but who -- how many were exposed to  
8 Hadnot Point.

9 Originally, when we did the earlier study, we had a  
10 very small group that we thought were exposed to Hadnot  
11 Point. We found an odds ratio of 1.5 for small-for-  
12 gestational age, if I remember right. But we would like  
13 to also look at trichloroethylene if the numbers are  
14 there. And the numbers would be there if we find that  
15 some of the Hadnot Point water went to Holcomb Boulevard  
16 for any length of time beyond '73 or whatever.

17 DR. WALSKI: Was there distribution -- or any kind of  
18 distribution measurements of TCE at Hadnot Point, or is --  
19 I mean, we talked to Jerry during the break and he says  
20 there were well measurements, but were there any  
21 distribution measurements of TCE?

22 DR. BOVE: At Hadnot Point?

23 UNIDENTIFIED PANELIST: Yeah; at Hadnot Point.

24 DR. WALSKI: Okay; because I wasn't seeing it in this  
25 one list.

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1 DR. BOVE: In the old assessment, there were.

2 DR. WALSKI: Okay.

3 DR. DOUGHERTY: Let me go back -- the recorder has a  
4 question.

5 COURT REPORTER: Well, the recorder didn't hear what  
6 was coming from behind me, and I think it was the answer  
7 to one of the questions. So it's not in the record. If  
8 you want it in the record, please, identify yourself and  
9 get to a microphone.

10 MS. HOSSOM: Okay.

11 COURT REPORTER: Thank you.

12 MS. HOSSOM: Hi, I'm Carole Hossom. I wrote the 1997  
13 Public Health Assessment. And at Hadnot Point, I believe  
14 the data shows -- excuse me -- 1400 parts per billion TCE  
15 at Hadnot Point.

16 DR. BOVE: Tap sample?

17 MS. HOSSOM: Excuse me?

18 DR. BOVE: Tap sample?

19 MS. HOSSOM: Tap; drinking-water sample.

20 DR. WALSKI: Okay. Was that -- so there was one  
21 measurement made there historically, or were there --

22 MS. HOSSOM: No. There were a few, but a handful.

23 DR. WALSKI: That was the range of numbers because it  
24 wasn't on this summary sheet here, and that's why I was  
25 asking if we had much.

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1 DR. LABOLLE: Okay. Was TCE the principal  
2 contaminant there, or was there also PCE?

3 MS. HOSSOM: For Hadnot Point, TCE was the principle  
4 contaminant and degradation products of TCE, not PCE.

5 MR. HARDING: Okay. While you're there, don't --  
6 because if I recall correctly -- I don't have that open in  
7 front me -- there was also an estimate of vinyl chloride.

8 MS. HOSSOM: Right.

9 MR. HARDING: Was that -- was that at any measurement  
10 of that, or was that just a calculation based on assumed  
11 degradation?

12 MS. HOSSOM: It was a -- because the laboratory-  
13 detection limit was only ten parts per billion, the -- it  
14 was estimated at below that to be eight. Although it was  
15 not calibrated below ten, it was an estimated measured  
16 value.

17 MR. HARDING: Okay. So it was detected.

18 MS. HOSSOM: It was detected.

19 MR. HARDING: But not quantifiable.

20 MS. HOSSOM: But not quantifiable.

21 DR. DOUGHERTY: So is that a quantitation limit,  
22 you're talking about, and not a detection?

23 MS. HOSSOM: Correct. It was quantified, but it was  
24 below the limit. So that's how it was reported as an  
25 estimated detected value as opposed to not detected. Does

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1           that clarify that?

2           MR. HARDING: Uh-huh.

3           MS. HOSSOM: Okay. So Hadnot Point was TCE. Tarawa  
4 Terrace was PCE; majority contaminants and then  
5 degradation products.

6           DR. JOHNSON: Okay. Thanks.

7           MS. HOSSOM: Thank you.

8           DR. JOHNSON: So with regard to Question 2, Morris,  
9 what do you think you have heard?

10          MR. MASLIA: I've forgot to give myself a copy.

11          MR. HARDING: Well, can I --

12          DR. JOHNSON: Please, Ben.

13          MR. HARDING: I'm still not sure we can answer  
14 Question 2 yet because I'm confused again. And forgive  
15 me, but, Dr. Bovey --

16          DR. BOVE: Bove.

17          MR. HARDING: Bove. Sorry. I understand now that,  
18 okay, we're also interested in the TCE exposures in Hadnot  
19 Point, and you talked about also looking for exposures in  
20 Holcomb Boulevard. But it seems to me that -- let me just  
21 see if I can frame this. And I apologize if I get this  
22 garbled. But in doing this analysis, we're going to  
23 compare the exposed populations to an unexposed -- I think  
24 you guys call it -- case control or whatever.

25          DR. BOVE: Just keep with exposed and unexposed.

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1 MR. HARDING: Okay.

2 DR. BOVE: Because cases and controls are both  
3 exposed and unexposed.

4 MR. HARDING: Okay. So we have to find -- ideally,  
5 we'd like to find some populations on the base that were  
6 exposed to TCE. We already have established that there's  
7 a likelihood, high likelihood, that you can identify  
8 populations that were exposed to PCE at Tarawa Terrace.  
9 But then we also need to find a population that's  
10 unexposed. So that population that's unexposed would  
11 potentially be in Holcomb Boulevard during periods when  
12 the two weren't interconnected.

13 DR. BOVE: Right.

14 MR. HARDING: Okay. Now --

15 DR. BOVE: But -- but there are interconnections.  
16 And that's what I'm concerned about.

17 MR. HARDING: Well, representing those  
18 interconnections is the complicated part of this. So the  
19 question I have is -- is that: Can you select your  
20 unexposed population from time periods where we're  
21 reasonably certain there were no interconnections, where  
22 Holcomb Boulevard operated independently of the other  
23 water-distribution systems?

24 DR. BOVE: Well, that's the question, though, I  
25 think; isn't it?

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1           MR. HARDING: Well, no. Is it adequate for your  
2           purposes? is what I'm asking. You don't have to -- do you  
3           have to -- do you have to have an unexposed population  
4           that goes from 1968 to 1985, or can you pick a population  
5           that, potentially, let's just say, from 1971 to 1981?

6           DR. BOVE: No. We have to be able to determine for  
7           that whole period who was exposed and who was unexposed.  
8           Okay. So -- and if we -- we can misclassify people as  
9           exposed or unexposed, but we need to know that.

10          MR. HARDING: Okay. Well, can we have three groups:  
11          exposed with some degree of certainty; unexposed with some  
12          degree of certainty; and we don't know, which we put  
13          aside? See what I'm saying?

14          DR. BOVE: See, the design of the study is that you  
15          -- we use the whole time period as the -- I mean, the  
16          population is all the births during that time period.  
17          Okay. We take a sample of all the cases from that time  
18          period, and we take a sample of controls. The controls  
19          are supposed to give us some reflection of the exposure --  
20          the proportion exposed in that population. That's the  
21          purpose of a control series.

22          We're using that whole time period. So we have cases  
23          during that whole time period. We'll have controls during  
24          that whole time period. We need to assign exposure  
25          properly to those cases and controls. So the -- in the

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1 previous study we didn't do a case-control sample. We can  
2 do what you suggested because we can just -- we took  
3 everybody. So we can decide, all right, we'll just take  
4 this part of the population. But with a case-control  
5 sample, you take a sample of that whole population. You  
6 have to be able to assign exposure for that whole period  
7 of time.

8 DR. DOUGHERTY: As I recall, the Holcomb Boulevard  
9 came on-line in '73, the treatment plant. Is that --

10 MR. MASLIA: Between '71 and '73.

11 DR. DOUGHERTY: Somewhere in that time period.

12 MR. MASLIA: Yeah.

13 DR. DOUGHERTY: So -- and then the interconnection  
14 was turned off.

15 MR. MASLIA: No. We don't know.

16 DR. DOUGHERTY: We don't know that for sure?

17 MR. MASLIA: We know --

18 DR. DOUGHERTY: And we know that --

19 MR. MASLIA: -- at certain times, we know the  
20 interconnection between Hadnot Point and Holcomb  
21 Boulevard. I believe it's January. There is a date on  
22 the chronology. January of '85, we know there's a period  
23 in there that there was an interconnection because of a  
24 failure of a pump or whatever at Holcomb Boulevard. So  
25 there was an interconnection.

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1 DR. DOUGHERTY: And at the other end, we know that  
2 the connection at Tarawa Terrace came in somewhere in the  
3 '85 and possibly '84 with a temporary line. Maybe even  
4 '83, I think we heard, with a temporary line. So the  
5 period prior to 1971, we can say pretty much with  
6 certainty that Holcomb Boulevard people received water  
7 from Hadnot Point, which makes the classification  
8 straightforward. And let's see --

9 MR. HARDING: Well, you're a groundwater modeler, so  
10 you shouldn't be saying that.

11 DR. DOUGHERTY: No. This is strictly about whether  
12 there's a possibility as in a pipeline --

13 MR. HARDING: Yes.

14 DR. DOUGHERTY: -- that exists or doesn't exist. And  
15 so we can take care of that much of the window. You can  
16 fill in the rest of the blanks.

17 MR. HARDING: Well, but the reason -- I may be  
18 belaboring this point. But the reason is is that I'm  
19 trying to establish whether there's a way to avoid trying  
20 to do the complex and the highly uncertain water-  
21 distribution modeling, given the very sparse amount of  
22 facts we have about it.

23 And if -- and I want to put this question to the  
24 panel. Maybe you'll tell me to shut up about this. But  
25 the level -- we don't need to know a lot about the diurnal

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1 patterns of demand, if we're going to use more of a mass-  
2 balance approach to this. And so if we have this period  
3 of time -- is it weeks? months? years? -- that we  
4 absolutely must include to complete this study, that's a  
5 different story than if we can pick the times when we have  
6 reasonably good certainty.

7 If we have to include all of these periods, it's my  
8 opinion that we have to be very honest about the very high  
9 degree of uncertainty in the periods where we're doing  
10 water distribution fate and transport model. So I don't  
11 know. I'd like to hear what other people have to say  
12 because I've beat this horse pretty hard.

13 MR. ASHTON: I would just like to clarify one thing.

14 DR. JOHNSON: Come on up.

15 MR. ASHTON: There's a little bit of confusion about  
16 when the systems were interconnected. After this '72  
17 plant was constructed, unfortunately, the two systems --  
18 Hadnot Point and Holcomb -- they're at different  
19 pressures. There are quite a bit of difference in the  
20 elevation of the water tanks. So we keep, normally, those  
21 belts closed.

22 The operational procedure now -- and I'm not sure how  
23 long this dates back. But we contact the State when we  
24 open those valves to get approval for interconnecting the  
25 systems. We have two different operating permits for the

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1 systems. And so those systems are separate, and they're  
2 kept separate.

3 The line that we were talking about yesterday between  
4 the Holcomb system and the Tarawa Terrace system, that is  
5 something that has been confused, and we're in the process  
6 of clarifying it with both the construction drawings that  
7 we have to install the lines and also the operators that  
8 are familiar with the system. And we'll clarify that for  
9 you very soon, and that's what we're working on right now.  
10 But the people aren't here that have that information.  
11 But we feel it's in our construction drawings.

12 DR. BOVE: Would there be a record of every time you  
13 connected Holcomb Boulevard and Hadnot Point then?

14 MR. ASHTON: That's unfortunate. I don't believe  
15 there is unless the State has --

16 DR. BOVE: But if you record -- that's what I mean.

17 MR. ASHTON: -- unless the State has a record, which  
18 they might.

19 DR. BOVE: Okay.

20 MR. ASHTON: And I have no way of knowing what they  
21 have. But we'll try to find that out. We've got a  
22 request -- there's been some turnover at the State. We  
23 have a request through the State to try to get -- see what  
24 records they do and don't have, so...

25 MR. HARDING: Is there a distinct grade difference

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1       between the three systems, and if so, can you say  
2       nominally what the -- what grades they were, what grades  
3       they ran at?

4             MR. ASHTON: Yeah. I don't have the exact  
5       information of the difference in the elevation between the  
6       Hadnot Point and the Holcomb.

7             MR. HARDING: Which one was higher?

8             MR. ASHTON: Okay. I believe -- I believe the newer  
9       system is higher, if I'm not mistaken.

10            MR. HARDING: The newer being Holcomb?

11            MR. ASHTON: Meaning the Holcomb system, I believe.  
12       But I can verify that. The -- as Joel says, he wasn't  
13       sure which system -- the tanks, of course, were not --  
14       there were quite a bit of difference in the tank levels.  
15       And, of course, we try to keep our tanks full for fire-  
16       protection purposes, and that is the reason why that valve  
17       is normally closed and we have two separate systems.

18            DR. UBER: Just on that point, the data in that same  
19       Table 1 shows a 9-foot grade difference from -- actually,  
20       contrary to what you said from Holcomb -- I'm sorry, from  
21       Hadnot Point to Holcomb in that direction for the  
22       controlling tanks.

23            MR. ASHTON: So you're saying that the Holcomb plant  
24       is lower, you're saying?

25            DR. UBER: That's what -- just -- that's just what

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1           this data in the table shows --

2           MR. ASHTON: And I'll verify that.

3           DR. UBER: -- by 9 feet.

4           MR. ASHTON: That's -- that's -- we have records of  
5 all the differences in elevations. The guys who -- the  
6 guys that had that plan, he'd have it off the top of his  
7 head, but I don't, unfortunately.

8           DR. UBER: Yeah. I mean, that would be -- that's, of  
9 course, quite useful information to know in terms of  
10 interconnectedness. So that would be -- that would be  
11 good.

12          MR. ASHTON: The USGS has took with them all of the  
13 elevations. So we have all that information.

14          MR. MASLIA: We have land-surface elevations at the  
15 tanks.

16          DR. JOHNSON: Ben had put on the table sort of a  
17 request for reaction to a proposal. I didn't hear much  
18 reaction. Did I miss something?

19          DR. CLARK: I can give you my answer to Question 2,  
20 and I think the answer's yes. I think it's probably the  
21 best way you can go about it to develop diurnal patterns  
22 using this district metering approach, given the fact that  
23 you don't have other data available.

24          DR. JOHNSON: Okay. Let's move on to Question 3.

25          MR. MASLIA: Can I ask a question?

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1 DR. JOHNSON: Sure; of course.

2 MR. MASLIA: And it's sort of encompassing early --  
3 both days, and it's more of a, I guess, philosophical one.  
4 But I'll ask it anyway.

5 We acknowledge, both on the epidemiologic side as  
6 well as the modeling side, that there's a great deal of  
7 uncertainty. But what I'm hearing is -- or what I'm  
8 interpreting is that perhaps we should just throw our  
9 hands up even if we quantify it or make a gross  
10 assumption, very simplifying assumption, and that is, not  
11 degrading that approach. That may be a valid approach.  
12 But then the agency still has other parties to answer to.

13 And so my question is: How does the agency go about  
14 saying -- do we go about saying that this is the best we  
15 can do and we can refine it no further, or do we -- that's  
16 what I'm trying to clarify.

17 DR. WALSKI: Here's what I was going to suggest later  
18 on --

19 MR. MASLIA: Yeah.

20 DR. WALSKI: -- but since you brought it up now, I  
21 might as well talk about. It seems like -- my approach  
22 would be is to take what you've got now and say, "Okay.  
23 We know these people were exposed. We know these weren't.  
24 We're not sure about these." And in about six months use  
25 the model as best I can -- in about six months, study,

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1 write your report, and say that we could spend another two  
2 or three years on this and we can refine the numbers a  
3 little bit.

4 But, unless you have some hope that two or three  
5 years of more work is really going to make the numbers  
6 better, I think, you know, wrapping up the modeling part  
7 of this in a short time and saying this is -- this is --  
8 call it interim report to cover yourself. But say, "You  
9 know, we can -- you know, in a couple of months we can  
10 wrap this thing up, give you a good answer, and maybe we  
11 can get it 2 percent better if we spend another three  
12 years on it or something" is the way, I think, it's going  
13 to all play out is my prediction. And I could be totally  
14 wrong in it. You probably have some people...

15 DR. JOHNSON: And my opinion is: Someone who doesn't  
16 know much about this whole area of work, they're -- one of  
17 the parties you have to be concerned about is the  
18 scientific community. And I always found it very useful  
19 to try to anchor on those data that you had confidence in.  
20 And things that might rise to the level of speculation you  
21 discard, unless there's some really good reason for doing  
22 otherwise.

23 And so your response to those other parties who may  
24 want you to do God-awful things that may surpass your  
25 ability to do, you simply have to say that that's not

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1 possible. The science just doesn't take us that far. And  
2 we are going to base our work, whether it's in the area of  
3 water modeling or epidemiology, on the most reliable data  
4 in which we have confidence. And that's as far as we can  
5 go. That's as far as the science will let us -- take us.

6 DR. BOVE: Well, I still think there's a lot of work  
7 that could be done to get other data that's available,  
8 both records from the state, if necessary, or other memos  
9 and material that might give us a sense of how -- whether  
10 these systems were in -- used in an interconnected  
11 fashion.

12 And so I think that that's, more than modeling, is  
13 what I would push for. It's a lot more of getting that  
14 information from the vault that would help us clarify some  
15 of these questions.

16 DR. JOHNSON: That may be true, but you have to ask  
17 the question of: Well, what's it worth? And what am I  
18 willing to invest to go beyond what I have now with which  
19 I have some confidence? And as Tom characterized it  
20 earlier this morning, you're getting into perhaps the area  
21 of archaeology and that's -- may be quite appropriate. Do  
22 you -- I think you have to do something akin to kind of a  
23 cost-benefit effort to determine if it's worth it.

24 MR. HARDING: I would say that along those lines that  
25 the question can be framed as: Where do you want to spend

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1       your resources? And let me first respond to Morris and  
2       say, if you're interpreting what I was saying, I'm not  
3       saying throw up your hands at all.

4               What I'm -- what I'm advising is essentially the same  
5       thing here is that we ought to ask ourselves: Where can we  
6       get the most bang for our buck? And if I had to say right  
7       now where that is, it's in trying to refine the  
8       understanding of when the contaminants reached the wells  
9       at Tarawa Terrace and then -- I don't think we have much  
10      of an understanding about what happened at the wells at  
11      Hadnot Point if we're looking for exposures to TCE. So  
12      those are two areas where more emphasis could be put than  
13      on the water-distribution modeling.

14             And then when we get back to this issue of Holcomb  
15      Boulevard, the purpose of the Holcomb Boulevard analysis  
16      is to establish unexposed populations. And I think that  
17      you have to ask yourself: If we've got these sporadic and  
18      poorly defined periods where there was potentially some  
19      contamination in that system, think about whether you can  
20      exclude those periods from your analysis as a way of  
21      saving a huge amount of effort that can be spent better,  
22      to my way of thinking, in trying to reconstruct, for  
23      example, what happened at Hadnot Point in the groundwater.

24             So that's my take on it, and that's why I've been  
25      asking these questions now because I'm not sure that the

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1       -- if you want to do diurnal-demand reconstruction,  
2       there's various ways to do it. But I'm not sure whether  
3       you need to or not. That's my point. That's why I was  
4       having trouble answering the question.

5             DR. WALSKI: The impact of your suggestion is (off  
6       microphone).

7             DR. BOVE: We would lose some cases in a situation  
8       where we already have a small number of cases, and we  
9       would have to take a new sample of controls to fit the new  
10      population we're talking about. We've already sampled  
11      control, sent them to the vendor. We could -- and the  
12      process of interviewing will start, as you heard, next  
13      week. But that could be put on hold.

14            But my problem with this is that we don't know. I  
15      mean, we can -- I guess we can -- I mean, we don't know  
16      when the interconnections could have occurred, I mean, you  
17      know, the water flowing back and forth. So when would you  
18      say -- what groups of people, what periods of time should  
19      we exclude from our study?

20            MR. HARDING: Well, let me put the question another  
21      way. If you don't know when the interconnections  
22      occurred, how are you going to model them? I think you  
23      just have to bite this bullet. And you have to -- here is  
24      our best determination of when these systems were -- you  
25      have to do this no matter what. You have to say when were

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1           they connected and when were they unconnected. And what  
2           I'm saying is: Once you've made that determination, don't  
3           take the effort to model the interconnections.

4           DR. BOVE: No. Right. And I'd like to get these  
5           records from the state, if they exist.

6           MR. HARDING: Well, I think that's -- I think that's  
7           a good way to spend your money, and I think that doing the  
8           archeology in a case like this may well be warranted to  
9           figure out what happened. But once you've figured that  
10          out, then -- then really you've got to ask the question:  
11          Is it worth spending an enormous amount of energy to model  
12          these relatively short periods at the expense of doing  
13          what I think is more important?

14          And here, I'm speaking here as a ground -- or as a  
15          water-distribution person. But I think that the  
16          groundwater case at Hadnot Point is -- am I missing  
17          something, or do we know anything about the historical  
18          pattern of contamination at Hadnot Point?

19          DR. WALSKI: I think one of the things we talked  
20          about yesterday was, it's so complex that we really can't  
21          model it though. We kind of threw up our hands on that  
22          one and said, "We know there was contamination, and we  
23          know well-monitoring points, but there are so many sources  
24          there --

25          UNIDENTIFIED PANELIST: Yeah. Didn't I hear

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1 160-something?

2 DR. WALSKI: -- but I can't tell exactly which source  
3 went to which well.

4 DR. DOUGHERTY: That was the limit of information  
5 that we've had to review. So the answer is: I don't know.  
6 We may have some kind of generalizations.

7 DR. BOVE: I mean, we've been asked to determine when  
8 contamination arrived at Hadnot Point too. I mean, this  
9 is -- this was our charge early on. So forget the study  
10 for a minute. We were asked that question. And there are  
11 people out there who want to know the answer to that. And  
12 I don't know if we can provide that, if that's what you're  
13 saying, because of the multisources, and we don't have  
14 that information on those sources.

15 DR. JOHNSON: I think Jerry has a point to share,  
16 please.

17 MR. ENSMINGER: As far as the actual contamination of  
18 the Hadnot Point water system, you have earlier recorded  
19 data at the Hadnot Point system, actual analytical data,  
20 than you do at the Tarawa Terrace system. You have a  
21 report of October of 1980 from the Army hygienic team that  
22 came in there to do the preliminary test for TTHMs that  
23 identified chlorinated hydrocarbons in their water,  
24 extremely high levels.

25 And behind that, in parenthesis, he wrote "solvents."

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1 And they had several tests. They didn't find the  
2 hydrocarbons in Tarawa Terrace until 1982. But you do  
3 have analytical data which shows the actual contamination  
4 of the Hadnot Point system in 1980 prior to Tarawa  
5 Terrace.

6 DR. BOVE: But we don't have it before that, and  
7 that's --

8 DR. JOHNSON: Speak in the mike, please.

9 DR. BOVE: What we're trying to find out, though, is  
10 when the contamination first arrived. I mean, that --  
11 that's going to be the difficulty.

12 MR. ENSMINGER: Well, the hottest well in Tarawa --  
13 or at Hadnot Point was Well 651. We do have the  
14 historical data as to when that well was constructed, and  
15 it was 1972. And it was constructed at the back corner  
16 of the disposal lot, which had been in operation for some  
17 30-odd years at that time. And when it was tested, it was  
18 27,000 parts per billion of VOCs. I mean, it's not hard  
19 to figure out that that well was contaminated the day it  
20 was sunk.

21 DR. JOHNSON: Okay. Thank you very much.

22 DR. WALSKI: But you don't need a model to prove that  
23 though. I think that's the point. We can do that without  
24 doing sophisticated modeling for that.

25 DR. CLARK: Frank, what do you think the potential is

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1           for getting more data from the state that may be better to  
2           find exposures in the system? Does anyone know that?  
3           Does anyone know that?

4           MR. MASLIA: Early on, we -- Bob Faye and I went up  
5           to Raleigh to look through the historical records, and in  
6           the historical records, we found some information for the  
7           forties, fifties, sixties, and then nothing after 1969  
8           until the 1990s. There's not a single sheet anywhere.

9           DR. JOHNSON: Okay. I want to move on to Question 3.  
10          Is ATSDR's approach of developing three water-distribution  
11          system models appropriate to address answers needed for  
12          the epi study?

13          DR. CLARK: I think it is.

14          DR. JOHNSON: Lord love you for that. Thank you for  
15          that answer.

16          MR. HARDING: I don't think, based on what I know,  
17          that it makes sense to develop models for these systems.  
18          That's based on what I know right now is, that in the  
19          sense of using a modeling code -- I mean, all of what  
20          we're going to be doing is modeling. But a simple mixing  
21          model, I think, is appropriate.

22          The time when you would need to do something more  
23          sophisticated is during these periods of interconnection,  
24          which we can't even define and potentially will never be  
25          able to define. So based on that, I think that, yes,

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1 three models are appropriate. But they aren't -- they  
2 don't need to be a fully sophisticated hydraulic water  
3 distribution fate and transport model.

4 DR. JOHNSON: Well, that's a substantive comment.  
5 How does the rest of the panel feel?

6 DR. LABOLLE: I thought I heard something previously  
7 regarding the need to go back historically, in a related  
8 study or as part of this study or an extended part of this  
9 study, and look at cancer risks. And in that context, I  
10 think, I see that the Hadnot Point was connected with the  
11 Holcomb Boulevard system during the period that you had  
12 mentioned.

13 And if that's the case, possibly in those -- you  
14 know, those subtime periods there where there's the  
15 interconnection is here, employing. But other than those  
16 periods, I tend to concur from what I've heard here that  
17 the sophistication in the models may be sufficient at this  
18 point to answer some of the questions.

19 DR. CLARK: I think the sophistication should be at a  
20 level that you can create some typical diurnal-exposure  
21 curves. That's my opinion.

22 DR. WALSKI: Mine is that it's probably not worth the  
23 effort, given the amount of data we have here. We'll  
24 disagree to --

25 DR. CLARK: We'll disagree on that.

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1 DR. JOHNSON: James.

2 DR. UBER: I think that -- so first of all, the issue  
3 of interconnectiveness is different from the issue of  
4 understanding temporal -- or diurnal variation in  
5 concentration. What I'm hearing and what I would agree  
6 with is that more archaeology on the interconnectiveness  
7 should precede further refinement of the water-  
8 distribution system models.

9 I think that if you found through the archaeology  
10 that the interconnections were frequent and of long  
11 duration that that would be different from finding out  
12 that, you know, there was never any period when Holcomb  
13 was putting out less than one MGD. And therefore, from a  
14 simple flow balance, you cannot have had significant  
15 contribution of water in that area from another system,  
16 you know.

17 So I think that -- I think that the effort needs to  
18 be driven by those kinds of factors. I frankly don't  
19 think that the information is on the table right now to  
20 know -- to answer that question.

21 DR. KONIKOW: The distribution model -- in terms of  
22 when the interconnection was opened, I'm assuming that  
23 that connection was not the only source of water to  
24 Holcomb Boulevard, or was it? Because if it wasn't, then  
25 the distribution model could help refine which

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1 neighborhoods or sections received water from Hadnot Point  
2 versus which did not. And that might be very useful.

3 MR. MASLIA: Right.

4 MR. HARDING: I might add that the point Jim made  
5 earlier on the elevations of these tanks will prove to be  
6 critical in that assessment because, if our goal is to  
7 isolate the Holcomb Boulevard population, if that ran at a  
8 higher grade than Hadnot Point, then we've got the answer.  
9 But it isn't clear at this point.

10 DR. LABOLLE: I think, also, it's important to keep  
11 in mind that when you're all done and you're refining, for  
12 example, these diurnal curves that the source  
13 concentrations to these systems are going to vary over  
14 orders of magnitude potentially. And potentially -- and I  
15 say "vary in time" -- the actual source may have.

16 And the uncertainty is potentially an order of  
17 magnitude or more, two orders of magnitude, in these  
18 concentrations at the wells. And that's due to both  
19 geologic uncertainty and uncertainty in the source  
20 concentrations, as David has brought up, so...

21 DR. JOHNSON: So what have you heard, sir?

22 MR. MASLIA: Well, I go on vacation in about six  
23 months. No. The -- I mean, we're still -- we're still  
24 talking about two major issues. One is data discovery,  
25 and the other, again, is basically using simplified mixing

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1 models.

2 DR. JOHNSON: I heard a rather strong endorsement  
3 that the "archaeology" should be, maybe, pushed before  
4 other things -- pushed ahead before other things.

5 DR. CLARK: Is archaeology the same thing as data  
6 discovery?

7 UNIDENTIFIED PANELIST: I would agree with that;  
8 yeah.

9 DR. JOHNSON: Yes, I think it is. Turning to  
10 Question 4: Based on information provided by ATSDR -- to  
11 ATSDR by U.S. Marine Corps, pipelines connecting to Hadnot  
12 Point water-treatment plant service area with the Holcomb  
13 Boulevard water-treatment plant service area were opened  
14 for emergency purposes only.

15 Does the panel agree with the ATSDR approach that,  
16 because of this characteristic, these two areas can be and  
17 should be modeled as two separate water-distribution  
18 systems?

19 DR. UBER: The answer to that is easy. That's -- if  
20 we answer yes to that, then -- then that -- then we don't  
21 need to do the archaeology, and we probably don't need to  
22 do the distribution-system modeling with -- you know, I  
23 know that Bob feels differently. So I would say that --  
24 I would say that the answer to that is that you have to do  
25 -- I haven't seen the archeology to support saying yes to

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1           that.

2           MR. HARDING: The answer is: Challenge the predicate.

3           DR. UBER: Yeah.

4           DR. JOHNSON: Excuse me?

5           MR. HARDING: Challenge the predicate.

6           DR. JOHNSON: Challenge the predicate. Do others  
7 wish to weigh in on this? Peter?

8           DR. POMMERENK: I can just agree with the previous  
9 two speakers. If, for example, during main breaks, those  
10 valves were open to supply, you know, a portion of either  
11 system and we can -- certain windows occurred and how  
12 long, you know, the question would be then: Is that of  
13 significance for the epi study, if it's just a one-day  
14 interconnection or not.

15           And, you know, if it's not, then, yeah, there is two  
16 separate systems, and we -- I agree you won't need the  
17 sophistication of the water-distribution system modeling  
18 that is conducted right now.

19           DR. JOHNSON: Anyone else? I gather this is ATSDR's  
20 preferred direction: to consider them as two separate  
21 systems; is that right?

22           DR. BOVE: Not if it's not true, it isn't.

23           DR. JOHNSON: I don't think that was part of my  
24 observation.

25           DR. BOVE: Sure, that would be the easiest thing.

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1 DR. JOHNSON: What will you need to know in order to  
2 make that decision?

3 DR. BOVE: Well, if it was just one day, you know, we  
4 probably wouldn't have to worry about it. But if it was  
5 for months at a time that the water was flowing from  
6 Hadnot Point to Holcomb Boulevard, then we need to know  
7 that. I mean, I don't --

8 DR. JOHNSON: I understand. Okay. Question 6: An  
9 innovative approach for fire-flow testing was employed at  
10 Camp Lejeune, using continuous recording pressure monitors  
11 simultaneously at several fire hydrants while different  
12 combinations of hydrants were flowed. Is this approach  
13 technically sound and beneficial? Ben.

14 MR. HARDING: It seems sound to me. It's better than  
15 anything I've seen. So Tom's gone into a moment here.  
16 But it's a really interesting approach, and it seemed to  
17 work real well.

18 DR. POMMERENK: We've done a similar approach at a  
19 different military base where we had continuous pressure  
20 recorders, and it works very well. And I'm glad to see  
21 that employed in this study as well.

22 MR. HARDING: I would make this point, that in terms  
23 of calibrating the model you do need to have good data on  
24 the tank elevations. And so if you've had doubt about the  
25 SCADA system, those ought to be resolved because that's

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1 the other boundary condition you need.

2 DR. CLARK: Did you skip the question on: Should  
3 ATSDR consider using probabilistic analyses deliberately,  
4 or was that --

5 MR. MASLIA: I think -- I mean, we answered that. I  
6 don't have an extra copy of the sheet I handed out, but is  
7 that grayed out?

8 DR. JOHNSON: Oh, that was my oversight, to be  
9 blatantly honest with you. And you can write that off to  
10 early dementia. And we will return to that. I thank you  
11 for making that observation. Eric, do you have a comment?

12 DR. LABOLLE: No. It was the same comment about the  
13 earlier question.

14 DR. JOHNSON: Well, with my apologies, let us return  
15 then to that previous question: Should ATSDR consider  
16 using probabilistic analyses to assess the variability and  
17 uncertainty of, one, water distribution-system model  
18 parameters; two, nodal demands; and three, system  
19 operations? If so, what specific methodologies would the  
20 panel suggest or recommend?

21 MR. HARDING: Well, the answer in my mind is, to the  
22 general question of using probabilistic analysis is, yes.  
23 We had significant discussions about what needs to be  
24 represented here in a simulation.

25 And -- but what does get represented should be

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1 represented as uncertain variables in a probabilistic  
2 framework, and the most commonly accepted and readily  
3 accessible technique for that is Monte Carlo simulation of  
4 one sort or another.

5 So I think that ATSDR should not just consider using  
6 probabilistic analysis. They should do that, and they  
7 should frame the resulting intakes -- what I call intakes,  
8 body intakes, of these materials in an empirical or  
9 calculated set of credibility ranges based -- you know,  
10 with probabilities assigned to them. That's my view.

11 DR. CLARK: I think that it would be great if they  
12 can do that; yes. One technique that they might look at  
13 is the PRP approach that Steve Buchberger is using at the  
14 University of Cincinnati for individual household use and  
15 -- which I think fits your -- within the framework that  
16 you're talking about.

17 MR. MASLIA: Bob, would that not then require us to  
18 have flow information?

19 DR. CLARK: You'd have to make some estimates about  
20 individual household use; right. But you could aggregate  
21 those into demands or metered demands.

22 MR. MASLIA: Well, I'm saying, but we would need some  
23 metered information then.

24 DR. CLARK: If you had your -- going back to the idea  
25 that you have the metered district approach.

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1 MR. MASLIA: Well, that's the question because at  
2 least -- I may be jumping the gun, Dr. Johnson, as to what  
3 I'm hearing. But I'll go ahead and take another  
4 opportunity. What I'm hearing is that we should not  
5 proceed any further with the flow meters because of  
6 issues. Tom --

7 DR. CLARK: I think you should, so...

8 MR. MASLIA: Oh, okay. That's what -- I want to make  
9 sure we get that out and get a clarification on that.  
10 Could we have the panel address that issue? Just to give  
11 you the status, they're in the ground. Okay. They're  
12 operating. They're not calibrated, so...

13 DR. WALSKI: Well, I think the real source of  
14 uncertainty though is the well data. So if I was going to  
15 do a Monte Carlo simulation of this, I would not use  
16 demands of the houses as my undetermined variable or my  
17 C-factors at my variables that I would do statistics on.

18 I would use which wells are firing at which time.  
19 That's the one that I would treat as the stochastic  
20 variable because that's the one that's going to have the  
21 greatest impact on it is which well.

22 So you say, "Okay. We roll the dice, and this is the  
23 pattern of wells we're going operate, and we roll the dice  
24 again and see this pattern." Because I think that's the  
25 one that's going to cause the greatest variability in the

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1 results. We do have some data from the installation-  
2 restoration reports and things like that as to well  
3 concentrations.

4 You know, which wells were on at which time are going  
5 to make the real issue and not which house showered at  
6 this time versus which house flushed their toilet at that  
7 time. It's not going to be what's going to drive TCE.

8 DR. UBER: I think that this question is connected,  
9 in an obvious way, to all of the other ones, as far as I  
10 can tell, that we've talked about. The only other comment  
11 that I'd have to add is I would be -- I would be all for  
12 doing things probabilistically, assuming that they can be  
13 framed in a way that ends up being meaningful.

14 And my only problem with this is that I think it's  
15 basically tantamount to rolling back stochastic hydrology  
16 before it existed and just saying, "Should we invent this  
17 over the next two years?"

18 And I don't -- I don't think that you're starting  
19 from ground zero. I think you have things like, you know,  
20 Buchberger's PRP model and stuff like that. But you have  
21 really no -- you have no existing theory of any weight to  
22 -- with which to say roughnesses are spatially correlated  
23 or demands are -- how -- what their spatial, temporal  
24 distribution looks like. And so I think that, you know,  
25 you could get in trouble there by trying to do that.

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1 DR. LABOLLE: My experience has been that the  
2 geologic uncertainty in the context of the Monte Carlo is  
3 going to swamp out everything else. And that simply just  
4 translates directly into the arrival curves at these  
5 wells, which the sources to these systems. And as I've  
6 mentioned several times, you know, can you tolerate a  
7 couple of orders of magnitude, variability due to  
8 uncertainty in those curves?

9 Because when you start Monte Carlo-ing geologic  
10 uncertainty, that may be what you find out is the outcome.  
11 And so in my experience, though, it's going to swamp out  
12 other things. That may or may not be the case if you're  
13 actually seeing the exposed and unexposed population  
14 change based on roughness or something -- something of  
15 that sort, depending upon where these interconnections  
16 occur.

17 DR. BOVE: But -- see how I can phrase this. The  
18 variability you're talking about, it's not a daily  
19 variability. It's not a weekly variability. It's a much  
20 larger time frame.

21 DR. LABOLLE: Well, we have -- you have two things:  
22 variability and uncertainty. The variability in the  
23 geology, it's spatial variability; and the geometry, the  
24 hydraulic conductivities -- however you want to frame the  
25 geologic characterization. But it's heterogeneity

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1           essentially.

2           Then we have uncertainty. What is that? All you  
3           have are samples at a few points in space out there. And  
4           in particular, this TT-26 at Tarawa Terrace, which appears  
5           to be the main source of contamination potentially,  
6           although that's uncertain too at this point. And the  
7           source location are two points which have been  
8           characterized somewhat, I guess, as the source by  
9           monitoring well data in Tarawa Terrace by some log there.

10          But there's, for the most part, subsurface is not  
11          sampled. And so all that -- all that material that fills  
12          in these points, there's uncertainty there. And it's not  
13          layer cake, as the models represented. At least, it's not  
14          likely to be. Those are simplifications made for modeling  
15          purposes, and that -- the uncertainty in that, if one were  
16          to pursue modeling that, one would find, likely find, that  
17          that uncertainty would translate to a great deal of  
18          uncertainty in the arrival curves, and modeling that  
19          uncertainty is a different level of modeling than what's  
20          been proposed thus far, than what I've heard. It's not  
21          simply twisting the parameters in the existing model.

22          It could be. I mean, you could approach it that way,  
23          but there would also have to be a great deal of spatial  
24          refinement in the vertical, potentially in the horizontal,  
25          and then the way in which we change those parameters.

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1 We'd have to have some kind of geologic and context and  
2 probabilistic context related to the geology and its  
3 characterization.

4 MR. HARDING: I would like to really agree and  
5 support the opinions of both Eric and Tom, that the  
6 groundwater uncertainty is going to swamp everything else.  
7 And then it's the well operation that determines the  
8 introduction of the contaminants into the system. So it  
9 seems to me these are the two most important factors and  
10 that the -- we have to deal with the issue of  
11 interconnection and whether you're going to address that,  
12 but even so, those are the two most important things. And  
13 those should -- and they're really uncertain, so they need  
14 to be expressed in probabilistic terms.

15 DR. JOHNSON: Okay. Are there any other comments on  
16 this? Let's finish with Question 7. Is it feasible or  
17 necessary for ATSDR to simulate the complete 18-year  
18 historical period on a continuous basis? And in red, pink  
19 here, Ben, for your -- will monthly --

20 MR. HARDING: I can see it.

21 DR. JOHNSON: Just was trying to be helpful. So how  
22 do we answer that? Tom.

23 DR. WALSKI: You don't need distribution modeling on  
24 a continuous basis. I mean, it's nice if you want to do  
25 it, but I just don't see it as being that important

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1       because essentially we don't have a good way to determine  
2       which wells are operating at which times. So, you know,  
3       why beat the -- this dislinear to death just because we  
4       have nice models that'll solve it?

5             DR. CLARK: I agree with you, Tom (laughter).

6             DR. UBER: Our colleagues agree.

7             UNIDENTIFIED PANELIST: Even monthly simulations are  
8       going to be tough, but I suspect that's what --

9             DR. LABOLLE: I would like to add something since I  
10       had presented premeeting comments and suggested maybe  
11       averaging exposure over the month would require continuous  
12       modeling because that was my experience in another  
13       modeling effort in which I was involved. But in that  
14       modeling effort, we had multiple entries into the  
15       distribution system, and at the time, I was thinking along  
16       those lines. But this system with the single point of  
17       entry during much of the time periods of interest here, I  
18       don't think it's going to get you much.

19            MR. HARDING: I want to say that I think the ATSDR  
20       should try to calculate the potential exposures on a  
21       continuous time-series basis, whatever that time step is.  
22       Now, as I've probably said a hundred times here, I don't  
23       believe that in almost every case that requires water  
24       distribution fate and transport modeling, but I think you  
25       should try to reconstruct to your best estimate,

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1        basically, a set of probability, just empirical  
2        probability distributions, for the breakthrough curves for  
3        the model and for the contaminants that enter the system  
4        so that you have a time series that you can then correlate  
5        to the activities of the individuals. But that probably  
6        doesn't require what we term water-distribution modeling.  
7        It does require calculations that are really modeling, but  
8        it isn't using a modeling code, continuously or otherwise.

9            DR. LABOLLE: I don't recommend monthly time stepping  
10        in a fate and transport model for the groundwater as an  
11        input to your system. I think that's going to end up  
12        being a much smaller time scale than the information  
13        that's available, simply due to constraints and the way in  
14        which these models are run to get a numerically valid  
15        result. And that's going to give you something, curves,  
16        out of these models that are on a temporal scale, which is  
17        much finer than a -- it's probably going to be fractions  
18        of day, and that's the kind of output you're going to see  
19        from there.

20            DR. JOHNSON: This completes these questions.  
21        Morris, Frank, anything else you'd like to put before the  
22        panel in the spirit of this kind of specific questioning?

23            MR. MASLIA: I'm still unclear on the flow-meter  
24        issue. It's a critical issue for the agency and the  
25        Marine Corps, and it may be that the panel has differences

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1 of opinion, which is fine. But I think for the record we  
2 really need -- if there's any way --

3 DR. JOHNSON: You want some clarity as --

4 MR. MASLIA: Yes.

5 DR. JOHNSON: -- to position.

6 MR. MASLIA: Position; yes.

7 DR. JOHNSON: Tom, do you want to start?

8 DR. WALSKI: Well, if you've installed them already,  
9 I would try and get them calibrated and see what I could  
10 learn from them. But I wouldn't -- the ultimate impact of  
11 that on the final bottom line of the study is going to be  
12 really small. It's not -- you know, the fact is though  
13 that, you know, it doesn't hurt to know that. But I  
14 wouldn't really spend a huge amount of resources on it.  
15 You know, try to get them calibrated because, looking at  
16 what Peter just showed me, the threshold on those things  
17 is like 2.2 feet per second. And most of the time, you're  
18 below 2.2 feet per second, so it's questionable whether  
19 you're going to get good data out of those things.

20 DR. JOHNSON: So why do it?

21 DR. WALSKI: Well, it's in there, so try it.

22 DR. JOHNSON: No. That's not a reason. Tom, that's  
23 not a reason. Why do it if it's not going to give you  
24 anything of use?

25 DR. CLARK: I think it -- I'm a little more

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1 optimistic than Tom in terms of what data you're going to  
2 get out of it. I think that plus the flow balancing of  
3 the tanks using SCADA data would probably give you a  
4 pretty good estimate as to what the demands are in those  
5 zones.

6 DR. JOHNSON: Peter, yes or no?

7 DR. POMMERENK: Well, I'm not quite sure whether, you  
8 know, any background noise, electrical noise, at those low  
9 flows will really be able to help us detect significant  
10 flows in those oversized mains; that somebody indicated  
11 earlier they're oversized for five of those. So, yeah,  
12 the question is: Are we going to get any useful data out  
13 of it? So if we have to open hydrants to perform the  
14 calibration, that is -- it's fine, okay to calibrate it,  
15 but in reality, this is not the flow that we usually see.  
16 So my expectation is that there may be no useful data  
17 coming out of that.

18 DR. JOHNSON: David, do you want to weigh in on this  
19 issue?

20 DR. DOUGHERTY: No (laughter).

21 DR. JOHNSON: Okay. That's a very fair response.  
22 Lenny.

23 DR. SINGH: I think it may be --

24 DR. JOHNSON: Please.

25 DR. SINGH: -- it may be opportunity to ask Morris as

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1 to his experience so far with regard to metering the flow.

2 MR. MASLIA: The -- it goes back -- one of -- the  
3 concept of installing a flow-measuring device goes back  
4 because of the inconsistency in the SCADA data originally  
5 and trying to get at two things: getting a total flow,  
6 which you can sum up from the different locations; and at  
7 the same time, while you're getting a total flow, you can  
8 also do the area, area-type analysis.

9 One of the issues we ran into is that we've got a  
10 report, the conservation study, which admittedly is taken  
11 from a water-budget standpoint -- but showed approximately  
12 a 30 percent difference in water going in and coming out.  
13 Of course, you can just allocate that. You know, one  
14 method is just distribute that equally every place. That  
15 may or may not be accurate.

16 So that was another factor, in that we've got a  
17 documented approach that summed up water use and was plus  
18 or minus 30 percent. From that standpoint -- that was not  
19 acceptable from an epidemiologic standpoint. So those two  
20 factors taken in combination led us to suggest that by  
21 installing flow meters we could accomplish two things at  
22 one time.

23 We would have -- we would be able to quantify by  
24 summing up the various flow meters production versus flow,  
25 and then really establish is that 30 percent difference

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1 reality, or was that just a method or a consequence of the  
2 method that was used, the inaccuracy in that first method?  
3 And at the second time -- at the second point also be able  
4 to, at that point in time, determine areas, specifically  
5 family-housing areas, due to the absence of individual  
6 house meters.

7 At this point in time, as I said, the meters are in.  
8 The modeling that we've done to date -- and I'm saying  
9 this so you can understand because the comments about the  
10 low flow are an issue. We had -- when we did the test  
11 last May at Hadnot Point, we had -- I won't say  
12 significantly -- we had larger, larger flows. And that  
13 model to date, the present day, is probably the best of  
14 all three.

15 The subsequent models for Holcomb Boulevard and  
16 Tarawa Terrace, we've attempted to do the calibration  
17 based on flow information in levels this fall and winter.  
18 And that's, of course, when we've been trying to install  
19 or calibrate these meters during a period, which  
20 admittedly is a -- even based historically is extremely  
21 low, low-demand conditions.

22 Our attempt or our plan was to have them calibrated  
23 in sufficient time so for the peak-demand season, then you  
24 would have the higher flows. We're still aiming for that,  
25 and that's why I needed some feedback from the panel is

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1       that all our attempts to date have been trying to  
2       calibrate them under exceedingly low-demand conditions.

3             DR. POMMERENK: One question: Have -- based on your  
4       preliminary data collection, can you tell anything about  
5       the accuracy of those meters, whatever you've measured so  
6       far? Or have you collected any data and compared it with  
7       -- you know, Claudia showed us that graph earlier about  
8       one location. Could you compare, I mean, instantaneous  
9       flow rates and maybe cumulative flow rates?

10            MR. MASLIA: Well, that's why we prepared the --

11            DR. POMMERENK: Okay. That was passed on.

12            MR. MASLIA: Yeah, it was passed on. But the concept  
13       behind that -- so that when we're in the field, we  
14       prepared a minimum, a maximum, and an average, then we  
15       would be able to see immediately -- we have not had that  
16       before -- you know, if the flow meters were somewhere in  
17       between those range of flows. We'd be okay. We'd go  
18       ahead with the calibration.

19            On one meter, as it turned out -- this was on the  
20       24-inch pipe -- obviously, there's no flow. It turns out  
21       to be a by-pass or a pipe to balance some tanks. And of  
22       course, we're not -- you know, we're pulling the meter and  
23       not using the meter there. As it turned out, that was not  
24       a useful location.

25            But we do have some preliminary information based on

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1 the model simulation, which we're hoping would guide the  
2 calibration process. However, what we -- what we have  
3 seen is if you assume the meters have been calibrated and  
4 we come up for QAQC, when we do flow a hydrant, you know,  
5 increase the flow from up to, you know, 600, 800 gallons a  
6 minute, there's a substantial difference in what the  
7 meter's recording and what we're flowing.

8 What they have done for the calibration process, just  
9 so everyone's clear, is they go down into the manhole and  
10 strap an ultrasonic, a trans, which is plus or minus 1  
11 percent. And then you read the Dynasonic, which is  
12 supposed to be plus or minus 2 percent, so we figure, you  
13 know, they should be within a few gallons per minute of  
14 each other, and they're not.

15 DR. JOHNSON: Does anyone else wish to comment?  
16 Peter.

17 DR. POMMERENK: Just one more question: You mentioned  
18 the 30 percent difference between a water-conservation  
19 study results and water-production records.

20 MR. MASLIA: That is -- that is correct. And that's  
21 not a critique of the study. I'm just giving you --

22 DR. POMMERENK: No. I'm just wondering: What do you  
23 attribute these 30 percent discrepancy to? Is that -- is  
24 that mis -- over- or underestimating household demands or  
25 commercial demands, or is that actually just an estimation

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1 issue so you're not assuming it's leakage, or --

2 MR. MASLIA: Well, no; no. I'm not assuming it's  
3 leakage. It's both the -- what I attribute it to is that  
4 methodology is a water budget, adding up, you know,  
5 lavatory, sinks, showers, and things of that nature and  
6 coming up that way. I don't believe -- it may be a small  
7 amount of leakage, but I don't have any knowledge on that  
8 so I attribute part of it, at least, to the -- to that  
9 methodology.

10 I don't know if that's a standard, acceptable amount  
11 of difference or not. And in the other -- and so what we  
12 wanted to, again, determine with the flow meters is we've  
13 got on one hand the total production or total delivered  
14 water at the plant. Okay? So that's what -- and that was  
15 our only other number. So even in the models that we have  
16 right now -- for example, Hadnot Point or whatever, you've  
17 still got this if you use the water-conservation study.

18 That's how we spatially distributed building use and  
19 all that type of use per building and all that. And we've  
20 got a 30 percent difference. We can evenly distribute it  
21 or not, and that's another -- again, what we were hoping  
22 to obtain with the flow-meter information is a more  
23 quantifiable estimate or even areas where you have better  
24 estimates than other areas.

25 DR. JOHNSON: Yes, Peter.

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1 DR. POMMERENK: I'll let Tom go ahead for a while.

2 DR. WALSKI: Well, first of all, I'm assuming that  
3 when you measure the discrepancy the production was higher  
4 than the estimated consumption; right? Your estimate was  
5 production was up here and what the method says was down  
6 here; right?

7 MR. MASLIA: Yes.

8 DR. WALSKI: So it was higher. The production was  
9 higher. So, yeah, it is likely that there is leakage to  
10 that extent. And also, they're thinking about these  
11 methodologies that you're using that are based on typical,  
12 average customers. And one thing that you learn is that  
13 you never have a typical, average system. So that type of  
14 discrepancy is not, you know, anything that would alarm  
15 me.

16 You know, they say, "30 percent. My God. That's a  
17 lot." But no. It's not really. It's not that bad.

18 DR. JOHNSON: Peter.

19 DR. POMMERENK: Yeah; just the other issue. You  
20 mentioned you were waiting for higher demands during the  
21 summer for doing additional validation of the metering  
22 data or --

23 MR. MASLIA: What we were -- what we -- and we're  
24 still anticipating to cal -- we're trying to calibrate the  
25 meters during this period -- winter, early winter, fall,

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1 winter -- in anticipation of collecting about six months  
2 of metering data to be able to capture the high-demand  
3 period.

4 DR. POMMERENK: But have you -- has your review of  
5 past production data indicated that there is substantial  
6 -- a substantially higher demand during the summer months?

7 MR. MASLIA: Yes; yes. The USGS reports show that.

8 DR. POMMERENK: Okay. I'm just asking the question.  
9 We have recently completed a related study, and my  
10 recollection -- and I may be wrong -- we didn't really see  
11 a pronounced summer. I'm willing to share that data with  
12 you, so...

13 MR. FAYE: It's a difference of -- it's how you  
14 define "substantial."

15 DR. POMMERENK: Okay.

16 MR. FAYE: But I'm looking -- I have the reports with  
17 me; unfortunately, not exactly here in the room. But off  
18 the top of my head, I'm looking at -- I'm thinking of  
19 perhaps a 20, maybe 25 percent difference between, say, a  
20 demand from January through March versus, say, June  
21 through September.

22 DR. POMMERENK: Okay. I would think substantial is  
23 if you're maxed is a factor of two or three over the  
24 average annual demand, daily demand. So you don't quite  
25 see --

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1 MR. FAYE: No.

2 DR. POMMERENK: -- those.

3 MR. FAYE: No.

4 DR. POMMERENK: Okay. With respect to the flow  
5 metering, obviously, the increases in flow during the  
6 summer are not expected to increase that much; right?

7 MR. FAYE: Maybe I can invent a different way of  
8 saying it, but the average daily demand, for example,  
9 during the period -- and this is basewide; basewide, not  
10 selective to Holcomb Boulevard or Tarawa Terrace or  
11 whatever. The average daily demand during July and August  
12 would perhaps be 25 percent higher, greater, more than,  
13 the average daily demand during January through February  
14 -- January through March. Okay?

15 DR. POMMERENK: Thanks.

16 DR. JOHNSON: In summary then, is it fair to say that  
17 there -- that some panelists have some concerns about the  
18 flow-meter work and would suggest, given limited  
19 resources, particularly personnel, that ATSDR look at this  
20 in terms of, in effect, what the cost/benefit is? Is this  
21 data worth what it's going to cost you to get? Is that a  
22 fair statement? Should it be changed? Morris is looking,  
23 I think, for a rather clear statement from the panel.

24 DR. CLARK: Well, given where you are in terms of  
25 actually installing the meters, how much more effort would

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1           it take to actually do the next step?

2           MR. MASLIA: On our part, probably a couple of weeks  
3           with a couple of people. That's basically the time to  
4           calibrate the meters. And then, of course, on the Camp  
5           Lejeune staff, because they assist us in collecting the  
6           data, downloading the data -- it's going around to 16  
7           meters once a month. They have the capability of storing  
8           more but, say, once a month downloading the data.

9           So manpower-wise or labor-wise, I don't think it's --  
10          it's the calibration process that's intensive, and it only  
11          seems more so intensive because of the past attempts that,  
12          obviously, we have made and have not been successful. But  
13          now that we've got sort of a step-by-step how-to manual  
14          and some estimates of what we expect to see the flows to  
15          be based on our model simulation, we're hoping that it  
16          will go much -- you know, on schedule. So basically,  
17          you're talking about a two-week effort with a couple of  
18          people from ATSDR.

19          DR. JOHNSON: Okay. Last comment from Tom.

20          DR. WALSKI: Okay. I've got more comments. This is  
21          my last (laughter).

22          DR. JOHNSON: It's the last one on this issue.

23          DR. WALSKI: Okay. The -- to put this thing in  
24          perspective, the calibration data is the calibration of  
25          water -- calibrated water-distribution model, which we

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1       aren't sure we're going to need. So first of all, we have  
2       that issue to get over.

3               But, in the meantime, since we have made this  
4       investment, I think it's worth getting like a month's  
5       worth of data and just looking at it and seeing what does  
6       a month's worth of data say. And then we can decide if  
7       it's worth doing several months; just for the background  
8       information. It may be good for the utilities' people  
9       just to have this data to help them manage this system  
10      even if you don't use it for calibration.

11             So I'd say, you know, try it for a month. There's  
12      going to be some places where you have shuttling between  
13      the tanks where the velocities are going to be high, and  
14      you are going to get good information. There are going to  
15      be some dead-end areas where you're going to be below the  
16      threshold half the time or so, and it's not going to be  
17      very useful information.

18             But get a month's worth of data, and if it looks good  
19      and the people from the utility think it's worth  
20      collecting, then keep on collecting it. And then if you  
21      do have to use it to -- if you decide to do a more  
22      detailed model or a more detailed calibration, you'll have  
23      it. So that's the way I would put it in perspective.

24             MR. MASLIA: One point, Dr. Johnson. Actually, it's  
25      an answer to Peter that came to mind with respect to

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1 variation in production or flows. When we were doing our  
2 testing in May of 2004 at Hadnot Point, we were seeing on  
3 the average of about 2100 gallons per minute being  
4 produced out of that plant during the week of our test,  
5 more or less.

6 When we came back in August, although we were not  
7 testing Hadnot Point, I just took the opportunity to go  
8 over to the chart, and it was up at 3,000 gallons per  
9 minute, so...

10 DR. POMMERENK: Okay.

11 DR. JOHNSON: Any more? Tom, anything else on this?

12 DR. WALSKI: Mm-mm.

13 DR. JOHNSON: Thank you. The panel, I think, has  
14 done an extraordinarily excellent job of responding to  
15 these questions and issues as well as those yesterday.  
16 The work that remains for the panel is to respond to the  
17 four specific charges, and we've talked about almost all  
18 of them. And so that's the work that remains.

19 I foresee us being able to finish by around 1:30 and  
20 such. That means that a public comment period needs to be  
21 moved up, and I'd like to offer the opportunity now for  
22 any comments from the public. Yes, Ben.

23 MR. HARDING: Can I just ask one --

24 DR. JOHNSON: Please; of course.

25 MR. HARDING: -- question before we do that?

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1 DR. JOHNSON: Yes.

2 MR. HARDING: We have this amended question, issues,  
3 and discussions page, which has explicitly marked out  
4 certain bullets. And then on the original sheet, there's  
5 issues. On page 3, there was integration of groundwater  
6 and water-distribution systems. Did we deal with that  
7 yesterday? Was that -- or has that been implicitly X'd  
8 out?

9 DR. POMMERENK: X'd out.

10 MR. HARDING: X'd out. Okay. It just --

11 MR. MASLIA: That was my -- that's why I didn't bring  
12 it up. I didn't X it out, but, based on the discussion  
13 that we've gone today, that becomes a moot point, at least  
14 from my interpretation.

15 MR. HARDING: Okay. That was what I thought, but I  
16 just wanted to make sure.

17 DR. JOHNSON: Okay. Comments from the public. Mr.  
18 Ensminger.

19 COURT REPORTER: I need to go down.

20 DR. JOHNSON: Oh, excuse me. Let's take about a  
21 ten-minute break.

22 COURT REPORTER: All I need is two minutes, if you  
23 just want to continue.

24 DR. JOHNSON: No. I think the panel needs to have a  
25 break. Let's break until lunch arrives.

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1           (Whereupon, a recess of approximately 28 minutes was  
2 taken.)

3           DR. JOHNSON: Okay. The floor is open for comments  
4 from the public. Mr. Ensminger.

5           MR. ENSMINGER: Not so much comments. I had a few  
6 questions on some of the things that were brought up  
7 during the discussion. It was brought up by one of the  
8 members from the Camp Lejeune delegation that North  
9 Carolina State requires separate permits for multiple  
10 water systems, and I have a question is: How long has that  
11 been -- requirement been in place?

12          MR. ASHTON: I'm not --

13          MR. ENSMINGER: Whenever you open and close a valve?  
14 How long has that requirement been in place?

15          MR. ASHTON: I'm not sure how long, but I can try to  
16 find that out there and also, you know, the -- I can  
17 certainly find when we got those permits for the water  
18 systems as well.

19          MR. ENSMINGER: And another thing about the Holcomb  
20 Boulevard water system was that it seems that there were a  
21 limited number of wells initially assigned to that water-  
22 treatment plant. Were the wells that were assigned to  
23 Holcomb Boulevard initially able to keep up with the  
24 demand for the area that it serviced?

25                 And the question of on the flow meters, there seemed

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1 to be a lot of dissension about that because of the  
2 oversized pipes. Would the installation of choke points  
3 -- somebody brought that up -- improve the accuracy and  
4 the velocity? I know it would increase the velocity of  
5 the water going through them. Would it increase the  
6 accuracy of the data? I mean, you're talking about 16  
7 flow meters. I don't know if all 16 are on 12-inch  
8 oversized lines.

9 DR. JOHNSON: Tom or Peter or both?

10 DR. WALSKI: Well, to increase the accuracy, whether  
11 or not we need it is still the question. So that's why  
12 I'd say: Don't spend this money until we're sure we need  
13 that extra quality of data would be the way that I would  
14 leave it.

15 DR. JOHNSON: Peter?

16 DR. POMMERENK: I agree.

17 MR. ENSMINGER: And on the Hadnot Point water system,  
18 the questions of historical data as far as contamination  
19 of certain wells, the installation-restoration program has  
20 the accurate data now for each well that was contaminated  
21 in the Hadnot Point system. They have the actual  
22 contaminants that were in those systems or in those wells,  
23 and they know what the sources were. So as far as  
24 reconstructing, you know, and doing the historical, there  
25 would be some work involved in it, but that data is

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1           available.

2           DR. JOHNSON: Okay. As I commented before lunch, I  
3           think we can certainly be through by 1:30. Some meetings  
4           go quicker than anticipated. I have been in many meetings  
5           where it's gone the other way and you reach 2:30 on the  
6           third day and you realize you're not done. And so this is  
7           quite to the contrary. And the preplanning done by ATSDR  
8           was really very, very well done, and presenting the issues  
9           and questions to the panel has helped us go through some  
10          of these tough matters that the ATSDR is going to have to  
11          deal with after we leave.

12          So my goal is to have us out of here around 1:30 or  
13          so. I propose to provide a formal response to Questions 3  
14          and 4 in the charge to the panel. I discussed with Mr.  
15          Maslia before lunch if all four were still relevant, and  
16          he indicated that we had really done a good job discussing  
17          questions or Charges 1 and 2. But he asked that we do  
18          provide a formal response to Charges 3 and 4. Charge 3 is  
19          now on the screen, and so that spares me having to read it  
20          to you now. How does the panel wish to react to this  
21          third charge?

22          DR. CLARK: One area that it seems to me that ATSDR  
23          might consider is looking at the degradation by-products  
24          of some of these oxidated chemicals, and I think there's a  
25          potential there that there might be things like vinyl

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1 chloride in the system, which I think would bias their  
2 results. And I hadn't gotten a sense of how much of that  
3 has actually been done.

4 DR. SINGH: Number 2 shows that we -- ATSDR already  
5 has started with their groundwater modeling. One portends  
6 to consent to the analysis, and the other one relates to  
7 the accounting for the variability recharge. I think  
8 those are the two issues that ATSDR should take into  
9 consideration.

10 DR. JOHNSON: Other advice on this charge?

11 DR. KONIKOW: Well, the groundwater modeling that we  
12 discussed -- and I think that's been focused on the Tarawa  
13 Terrace area. And I guess maybe we should talk for a  
14 minute about the need for looking at and modeling the  
15 groundwater flow and contamination in the Hadnot Point  
16 area or the Holcomb Boulevard area. Or do we just accept  
17 that Hadnot Point wells are contaminated over the whole  
18 time?

19 DR. LABOLLE: In addition, Lenny, you had mentioned  
20 previously -- and I concur with the need to at least  
21 demonstrate that contaminants arrive to TT-26 or  
22 demonstrate that they may not, depending on the outcome of  
23 the models within this for the 14-year time frame, for  
24 example, and to the extent that the study period's going  
25 to be pushed back further.

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1           In addition, somebody mentioned other periods of time  
2 we might be looking at the cancer risk. You may want to  
3 actually have a model that's useful for protecting the  
4 uncertainty in the arrival curve itself. I'm not sure if  
5 you're planning on going back before '68 at Tarawa  
6 Terrace.

7           MR. FAYE: Our intention has always been -- largely  
8 due to modeling considerations as well as others, but our  
9 intention has always been to begin the groundwater flow  
10 simulations at Tarawa Terrace with the beginning of  
11 operations of the WTP and the well fields, which would be  
12 like 1952, '53, and then simulate that forward to '94,  
13 which is the end of our relevant water-level record.

14           DR. LABOLLE: But the question would be the period of  
15 time from '54 through '68.

16           MR. FAYE: Yeah. To transport -- very definitely.  
17 We would do the fate and transport simulations as well for  
18 that period of time.

19           DR. LABOLLE: Well, but are they going to use it in  
20 the epi study?

21           MR. FAYE: That, I don't know. But I would just feel  
22 comfortable doing that. If we don't, there's always going  
23 to be a question there: Did the contaminants arrive at the  
24 wells in one month, six months, five years, or whatever?  
25 And I think that's an important consideration.

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1 DR. LABOLLE: I'm not suggesting that it not be done.  
2 Actually, I'm suggesting that the degree of effort put  
3 into this will depend upon whether or not the epi studies  
4 are in the future pushed back to earlier dates,  
5 I think.

6 MR. FAYE: That, I don't know. But our -- as far as  
7 the modeling is concerned, I can speak to that, and our  
8 plans from Day 1 have been to provide those simulations  
9 from the beginning of the WTP operation and the well-field  
10 operation, which would be, as I said, 1952 or '53.

11 DR. KONIKOW: For all three areas?

12 MR. FAYE: Just for the Tarawa Terrace. Lenny, as we  
13 said yesterday, we're using the Tarawa Terrace because it  
14 is a "simpler system." But it is a little simpler. So  
15 that's our -- what would you say? That's our prototype  
16 effort, and if we think we're successful there, then we  
17 can advance ourselves to -- if necessary.

18 I mean, if the epi -- epidemiological demands require  
19 that, then we can advance to a more complex system where  
20 we have this confidence that we've built on and attempt  
21 that, which would be Hadnot Point.

22 DR. KONIKOW: So is the default option then in the  
23 epidemiological study to assume that the Hadnot Point  
24 system was contaminated over the whole period of time?

25 MR. FAYE: I don't know what their default position

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1 would be. But based on the data that I've seen and how  
2 the wells are positioned with respect to obvious sources  
3 of contamination and whatever, yeah, I would say that  
4 there -- whoever said here today that when the particular  
5 well was actually opened up and began to be used, it was  
6 probably contaminated at that time. I would say that  
7 that's an accurate statement with respect to perhaps a  
8 number of wells, supply wells, at Hadnot Point.

9 And also through time -- I mean, the wells may have  
10 been -- in 1941 when the wells were constructed, there  
11 probably was no problem. And then over the years, as the  
12 facility grew and different things were done land-use-  
13 wise, why, yeah, they probably became contaminated.

14 MR. MASLIA: Two issues. If we go into Tarawa  
15 Terrace, from a groundwater fate and transport standpoint,  
16 if we don't start at predevelopment, then we have some  
17 real issues to address with antecedent conditions, and  
18 then we're going to have to do some more uncertainty  
19 modeling as to the effect of not knowing the antecedent  
20 conditions, which I think adds to our effort and, I think,  
21 overpowers the amount of additional effort, just by  
22 starting from before the -- from predevelopment and  
23 running them out. My understanding is we can also -- we  
24 can vary the step size in MODFLOW, can we not?

25 MR. FAYE: Oh, yes.

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1           MR. MASLIA: Yes. So we could use larger -- if we  
2 see there's no contamination, you know, for a certain  
3 number of years in the beginning after some trial runs, we  
4 can make those larger, larger step size, and then when we  
5 think it is down to a much smaller -- as you said 15 day  
6 or less.

7           I've actually used even smaller time steps for that  
8 previously and do that. And that would be, at least  
9 initially, my approach is not to complicate our analyses  
10 even more with trying to guess antecedent conditions but  
11 let the model do the work; in other words, circuitous  
12 development.

13          MR. FAYE: Yeah. At that -- yeah, the issue then  
14 very rapidly moves from a code-capability issue to a  
15 number-crunching issue, so that's where you're at there.

16          DR. LABOLLE: I wouldn't bother corseting the time  
17 study, in my opinion, simply because, I mean, you're  
18 probably not going to be constrained by the time it takes  
19 to run this model. And what that would then do is lead to  
20 possible numerical errors and a plume that doesn't look  
21 like the plume that the model was intended to solve for.

22          So you might as well just leave them at the required  
23 resolution to obtain a numerically valid solution. I'd be  
24 more concerned about the assumptions in the model itself  
25 than those kinds of issues and the underlying geologic

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1       characterization, which it looks like, you know, you've  
2       done a good job approaching that.

3               But the -- it's the way in which one deals with the  
4       uncertainty in there. And if I were to make any  
5       recommendation, I would recommend an approach to dealing  
6       with geologic uncertainty be incorporated into the  
7       analysis so that one can examine the uncertainty in the  
8       geology and its effect on arrival, potential arrival, to  
9       these various wells in the vicinity of this ABC's Cleaner  
10      there and of the -- some of the wells that are reported --  
11      reportedly clean throughout the periods of interest may  
12      have actually seen contamination because they simply  
13      weren't sampled continuously.

14             MR. FAYE: Right. They're --

15             DR. LABOLLE: And others that -- I'm sorry. Excuse  
16      me.

17             Others, you know, that have seen contamination, we  
18      don't know when the contamination arrived. And to the  
19      extent that maybe all of these are swamped out by  
20      concentrations of TT-26 and the models begin to show that,  
21      maybe you can lay these issues aside because the mixing  
22      that appears to have been in this system. All wells are  
23      mixing.

24             You may not need to pursue, you know, the groundwater  
25      modeling past that point in terms of determining what

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1 arrived at these other wells. But there seems to be  
2 another issue -- and I think that you and I discussed  
3 during the break -- where if TT-26 is turned off and these  
4 other wells have taken over --

5 MR. FAYE: Right.

6 DR. LABOLLE: -- and yet there may not be sampling at  
7 these wells to assess whether there was contamination  
8 arriving to them, and some of them are quite close to  
9 TT-26 and appear to be very capable of intercepting the  
10 plume.

11 MR. FAYE: That is a real issue; absolutely.

12 DR. LABOLLE: And so then you're left with modeling  
13 to resolve that.

14 MR. FAYE: That's right.

15 DR. LABOLLE: And once again -- I don't mean to  
16 belabor the point -- but I think it's geologic uncertainty  
17 that is going to swamp out a lot of other uncertainties in  
18 all of these modeling efforts of the water-distribution  
19 system. And that's going to be one of the main players.  
20 That and the source, as David will know.

21 MR. MASLIA: The other question or issue with respect  
22 to the Hadnot Point -- as Bob said, we're using Tarawa  
23 Terrace first. But if we assume or can assume that at  
24 least some of the wells were sunk into an aquifer upon  
25 production that was already contaminated, does that then

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1 not bring the problem in trying to simplify matters to a  
2 materials mass balance where if we knew the cycling on and  
3 off of wells we could calculate the concentration of the  
4 mixture on there? And that might then alleviate also any  
5 detailed numerical modeling of the Hadnot Point area with  
6 the large and nonpoint specific sources.

7 DR. JOHNSON: Okay. Let's then turn to Charge No. 4.  
8 And as that comes up on the screen, let me ask kind of a  
9 housekeeping detail of Mr. Maslia. Are arrangements being  
10 made for transportation to the airport? I mean...

11 MR. MASLIA: My understanding is some -- some people  
12 have arranged with the hotel shuttle, and all that needs  
13 to be done is to call the hotel shuttle when they are  
14 ready to board that hotel shuttle. Ann Walker or Joann  
15 can do that once we tell them we're -- we're finished.

16 DR. JOHNSON: Okay.

17 MR. MASLIA: If people want -- what?

18 DR. WALSKI: The shuttle doesn't bring us to the  
19 airport, does it?

20 UNIDENTIFIED PANELIST: There is a shuttle.

21 MR. MASLIA: There is a shuttle.

22 DR. WALSKI: Yeah. But not the -- a different  
23 shuttle; okay.

24 MR. MASLIA: Right.

25 DR. WALSKI: Okay.

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1 DR. CLARK: We're better off sharing taxis.

2 DR. WALSKI: Right. I think so; yeah.

3 DR. LABOLLE: Along the lines, yeah, I spoke with the  
4 driver on the way here, and he mentioned that he's trying  
5 to get us a large van to be able to go to the airport from  
6 here. And I have to actually have them deliver my bags  
7 here, and I mentioned that you --

8 DR. SINGH: Yeah. My bags are at the hotel.

9 (Whereupon, a conversation ensued off the record.)

10 DR. JOHNSON: Charge No. 4 gets under the matter of  
11 the project schedule. It seems -- it seems, at least to  
12 the Chair, that there have been a number of rather  
13 significant suggestions as to perhaps how to reorder the  
14 work that is anticipated. That makes it a little bit  
15 unclear, at least in my mind, as to how that works out in  
16 terms of a project schedule. But I would look forward to  
17 the comments from the board -- from the panel.

18 DR. CLARK: Subject to the comments that have made by  
19 the panel, it seems to me that the three-year planning  
20 projected cycle is probably a reasonable one to work  
21 towards.

22 DR. DOUGHERTY: Tom had suggested six months.

23 DR. WALSKI: Yeah. I can see you're getting to the  
24 point of beating a dead horse after a while that possibly  
25 you can do this in about six months unless you find that

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1 missing notebook. You know, the notebook that was on top  
2 of the refrigerator back in '85 that fell behind the  
3 refrigerator? And they move it, like, next year, and they  
4 find this notebook with all the data in it or something.  
5 Unless you find that kind of a notebook, I don't see three  
6 years of work giving us a much better answer than we can  
7 in probably about six months.

8 MR. MASLIA: Can I qualify that last charge so that  
9 everyone's on the same playing field here?

10 MR. FAYE: Did you look behind the refrigerator?

11 MR. MASLIA: I've looked in at a lot of places,  
12 including down a manhole. The three years was the total,  
13 not three additional years. That was three years of  
14 project length, and we have spent length approximately,  
15 what, a year or more? Less. So we really are only  
16 talking about another year and a half or so.

17 The initial schedule called to have some preliminary  
18 fate and transport modeling results with Tarawa Terrace by  
19 this September, which I believe we're on track for that.  
20 The question is the additional work, taking the  
21 suggestions of the panel. I've been trying to simplify  
22 them on the Hadnot Point area, assessing some preliminary  
23 flow data from the meters. Would, you know, the three  
24 years be sufficient? And the one comment I would have,  
25 given a perfect world where, even if you had to look for

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1 data, in six months would probably be acceptable.

2 Being -- doing the kind of detective work that we  
3 have to do with historic data, I would say shortening --  
4 my experience would be on this project that that would  
5 really be constraining the agency to shorten it any more  
6 than that, but I'm open to some concrete ideas where --  
7 Bob wants to.

8 MR. FAYE: I don't know, Tom. Maybe there's some  
9 pharmaceutical issues related to your comment there, but  
10 there's just no way in the world (laughter).

11 DR. JOHNSON: I don't know what that means. I'll  
12 speak. If no one else will speak, I'll speak. What are  
13 the pharmaceutical issues?

14 MR. FAYE: There's no way that I can imagine or  
15 devise or anticipate that we could -- we can fulfill the  
16 requirements or the suggestions of the panel here with  
17 respect to the groundwater-flow models and the fate and  
18 transport simulations and provide a comprehensive,  
19 complete, technically defensible written product in a  
20 six-month time period from today. I think that's a very  
21 unrealistic -- that would be a very unrealistic proposal  
22 or recommendation. And that's based on 30-some years of  
23 experience.

24 DR. WALSKI: But we have put those -- we've taken  
25 out, pretty much, most of the distribution modeling, and

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1       we're taking a fairly major chunk of the scope of work  
2       out --

3             MR. FAYE: Yeah, but the --

4             DR. WALSKI: -- and also cut out most of the modeling  
5       at Hadnot Point, too, for groundwater. So we've --

6             MR. FAYE: No. Let me clarify that. First of all,  
7       the -- there -- the -- as the time-line chart, I guess,  
8       that you've been -- that you have -- the groundwater  
9       modeling and the distribution modeling were parallel  
10      efforts. Okay. They weren't -- they weren't a series  
11      situation: One gets done and then the other. So those  
12      were all parallel efforts.

13            And so, I mean, we planned to converge the completion  
14      of the two efforts, at a point in time merge the results  
15      and then go on from there. So I think, as far as that  
16      parallel effort with respect to the groundwater-modeling  
17      situation is concerned, we're right on the regional time  
18      lines. I think we conformed to them very well.

19            And as Morris said, the -- we're having -- we're  
20      planning to have some fate and transport simulation  
21      results by the end of September, this fall. I think  
22      that's -- with a bit of work, that's probably doable.  
23      So -- and realistic. And so then I would anticipate  
24      finishing that project completely: providing the written  
25      report, the appropriate peer reviews, et cetera,

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1 et cetera, would still take most of the next year  
2 after that. So --

3 DR. CLARK: Don't you also have to integrate the  
4 epidemiological studies --

5 MR. FAYE: Exactly.

6 DR. CLARK: So you're talking, what, probably another  
7 six months to a year?

8 MR. FAYE: Absolutely; yeah; yeah. So there's a --  
9 even conforming exactly to what I've heard that you folks  
10 will probably recommend, this three-year time interval  
11 that we're looking at now with about a year and a half or  
12 so left is still extremely ambitious. And I don't know.  
13 I mean, maybe I'm just all wet, but I'd like to hear from  
14 some of my groundwater colleagues on the panel to tell --  
15 to say -- is that -- are you -- have you been smoking  
16 something, too, Bob (laughter)?

17 DR. JOHNSON: Well, there's a clarification.

18 DR. DOUGHERTY: What is the terminus of the three  
19 years? Is it the delivery of the water-modeling results,  
20 or is it the delivery of the epi results?

21 MR. MASLIA: The original schedule was three total  
22 years to deliver the final historical reconstruction to  
23 the epi people.

24 MR. FAYE: With all of its elements.

25 MR. MASLIA: And that included another -- another

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1 peer panel to assess the historical or the final report,  
2 as we did in Dover Township.

3 DR. DOUGHERTY: And the Hadnot and --

4 MR. MASLIA: Right.

5 DR. DOUGHERTY: -- Holcomb?

6 MR. MASLIA: That's -- that's correct. I will add --

7 DR. DOUGHERTY: Or whatever may be done with Hadnot?

8 MR. MASLIA: Right. I will add that Frank and I and  
9 the epi team had discussed, in fact, with Marine Corps  
10 headquarters, back in February that it was going to be a  
11 challenge, an extreme challenge, if we were going to the  
12 distribution-type stuff to even keep to that three-year  
13 schedule; an extreme challenge.

14 I think based on some recommendations here that  
15 three-year time frame becomes a more realistic and  
16 attainable goal. And that's really -- but, again, there  
17 are a number of, still, work efforts and implementing  
18 recommendations that you have made even with the  
19 simplifications.

20 DR. DOUGHERTY: My personal feeling is then that --  
21 and take the comment with a grain of salt because I really  
22 haven't seen the detail of the work plan for the other two  
23 portions of the site in terms of groundwater modeling and  
24 its impact. But I think the schedule is going to be  
25 aggressive because of the additional emphasis on the

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1 archaeology, as we've been calling it, and that really  
2 takes a lot of calendar time. It takes a lot of calendar  
3 time.

4 MR. FAYE: Absolutely.

5 DR. KONIKOW: I think, also, if the goal is to do an  
6 advective/dispersive transport model and that hasn't been  
7 started yet, that takes time. And that's going to take  
8 time.

9 MR. HARDING: If I might speak specifically about  
10 this July schedule --

11 MR. MASLIA: This is July of? Is that in the July  
12 book?

13 MR. HARDING: It's revised 13 July. It's the  
14 current.

15 MR. MASLIA: Right. There's probably one in  
16 September. I don't know if you've gotten it. We've  
17 revised it somewhat for -- in September. But you can go  
18 ahead. That's probably within a six- or eight-month  
19 period.

20 MR. HARDING: So if you look at this, the  
21 geohydrology of groundwater flow, fate and transport work  
22 appears to end, roughly, the end of this fiscal year,  
23 which is --

24 MR. MASLIA: Which is September 30th.

25 MR. HARDING: Of 2005?

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1 MR. MASLIA: Yeah; that's correct.

2 MR. HARDING: And then what extends beyond that is  
3 water-distribution system historical models; actually,  
4 water-distribution system present-day models. But we, I  
5 think, suggested that you dramatically compress that --

6 MR. MASLIA: Yes; yes.

7 MR. HARDING: -- which, I think, may move that out of  
8 what appears to be the critical path in this thing. Now,  
9 I tend to disagree with Tom because I have been swearing  
10 off all my pharmaceuticals recently.

11 But I think more time is necessary to characterize  
12 the Hadnot Point situation, but I don't really know that  
13 business. That's the groundwater people's business. But  
14 I go down here to this methods' development -- and maybe  
15 this was dealt with yesterday. But there's the GA  
16 calibration methods, tank mixing, and dynamic linkage of  
17 groundwater transport and water distribution models, which  
18 I think can be eliminated.

19 And I think that uncertainty methods in groundwater  
20 flow transport and also in terms of water distribution --  
21 or if we want to say integration of exposures and intakes  
22 and that stuff. Dealing with this in a -- dealing with  
23 uncertainty and quantifying it can be expanded. But that  
24 should not affect the overall length of the schedule. But  
25 those bars down there on all those methods' developments

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1 are really driving the schedule out to the right, and  
2 those should be essentially, I think, eliminated.

3 MR. MASLIA: Those were based, again, when -- were  
4 based when the schedule was developed, based on our  
5 previous experience, which they did drive the time frame.  
6 Although they were -- or at least now we see them as  
7 complementary, not driving the schedule.

8 And from the discussions that we've had here the last  
9 couple of days what, again, I see driving the schedule are  
10 two issues: the archaeology or data discovery. That is  
11 very time-consuming and labor-intensive as well as the  
12 methods to better understand the uncertainty with respect  
13 to geologic issues at Tarawa Terrace and going to the  
14 full-blown fate -- full blown as opposed to the effective  
15 full fate and dispersive transport models.

16 MR. HARDING: Well, I want to emphasize that I think  
17 that you can make a contribution, both to the  
18 understanding of this situation but also to the practice,  
19 if you would, instead of spending your resources on some  
20 of these methods that relate to linking the models, if you  
21 would spend more of your effort on quantifying and  
22 propagating uncertainty through the methods.

23 That is going to contribute more to a realistic  
24 assessment of the epidemiological situation in my view and  
25 also to the practice here because this is something that

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1 has been an undercurrent in all the discussions. But the  
2 practical matter of how you do this -- it's not like it's  
3 unknown, but it's something that could use some effort.

4 It would be a good thing for you to shift resources  
5 to that area, I think. That's my view, and I think that  
6 helps both your schedule, and, also, it puts your  
7 resources in a more appropriate area. And I agree with  
8 you that the resources should be spent, understanding the  
9 Hadnot Point geohydrology; is that right? Hydrogeology  
10 transport.

11 DR. DOUGHERTY: In my premeeting notes, I had  
12 compared the July version of the schedule with the version  
13 of the schedule on a preceding page of the handout. And  
14 even at that time, last summer, the areas in which the  
15 greatest slippage had occurred appear to be in collecting  
16 background information and then the development of the  
17 historical network information.

18 I don't think that we've reduced or accelerated those  
19 particular tasks in the last two days. And since those  
20 seemed to have been the ones that already grew before we  
21 had our two bits to say, they may slip further by as much  
22 as the six months that Tom talked about; my gut feeling.

23 MR. HARDING: When you say "slip," you mean be  
24 compressed?

25 DR. DOUGHERTY: No. I mean they've stretched out.

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1       They have been extended when you compare that page to the  
2       previous page. And what we're hearing is there continues  
3       to be data discovery that has some significance with  
4       interconnects, monthly pumping rates that are not yet  
5       complete. And their significance to the outcomes -- the  
6       requirements for the outcomes seem significant enough that  
7       they're going to stretch longer than I thought they would  
8       when I walked in here yesterday morning.

9           DR. JOHNSON: Well, that would seem to conclude our  
10       response to these Charges No. 3 and 4. My view of what  
11       remains is to offer, indeed encourage, any kind of dialog  
12       amongst the panelists on any issue that hasn't been  
13       addressed to your satisfaction, any matter that you  
14       brought up in your premeeting comments that has not been  
15       addressed to your satisfaction, and any points that might  
16       represent some differences of view within the panel. Put  
17       those on the table to the extent you wish to discuss them.

18           Following that, it's kind of an open-discussion  
19       opportunity. I'm going to conclude the meeting by asking  
20       each of you as panelists what you would recommend the  
21       agency do in regard to what you've heard about the  
22       groundwater work as well as the water distribution work.

23           And I don't know that -- as I said earlier this  
24       morning, that we want to take the individual advice and  
25       recommendations and attempt to synthesize them into a

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1 panel product. I don't know that that's in ATSDR's best  
2 interest because, to some extent, that may tie your hands.

3 But I think it is quite fair to ask each of you as  
4 individuals your comments on what you would recommend for  
5 the future. So with that on the table, what else do you  
6 want to deal with as a panel? Open discussion on points  
7 that haven't been addressed and then closing by asking you  
8 your individual comments; vis-à-vis, advice;  
9 recommendations; but not going that third step and  
10 attempting to compile a panel body of recommendations.  
11 How does that resonate with you, Morris? You're the  
12 primary user of these deliberations.

13 MR. MASLIA: I actually would prefer not having a  
14 vote, as you say, but rather having everyone's individual  
15 opinion or summary of their understanding of what took  
16 place today. I think that would be much more beneficial  
17 to us.

18 DR. JOHNSON: Is it fair for the panel to say, as a  
19 body, that we consider this work as extraordinarily  
20 important for various reasons, certainly in support of an  
21 epidemiological study, but for other reasons, as  
22 articulated by Ben, as a study that will advance the  
23 practice in the field as well? I'm paraphrasing. If I  
24 misstate this, please correct me.

25 But is it fair for this body to go on record, saying

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1       this is pretty important stuff with the epi study and the  
2       work that involves water protocol and that we would  
3       encourage ATSDR, given the importance of this work, to  
4       have resources that are commensurate with that importance?  
5       Does anyone want to take issue with that? Are you  
6       comfortable with saying that for the public record as a  
7       body? Important stuff. Let's get the resources that  
8       match the importance and urge ATSDR to provide those  
9       resources.

10       DR. SINGH: I think so. I think this is a very  
11       important study. This integrates hydrology, geology,  
12       hydraulic engineering, and health sciences. So it's a  
13       very important study, and it should be encouraged. And  
14       obviously, we would like the agency to provide  
15       commensurate resources.

16       DR. WALSKI: But we also have to be concerned that  
17       the marginal benefits exceed the marginal costs. And some  
18       of the things I'm still not convinced that they are from  
19       my perspective. But, you know, I'm just one voice.

20       DR. JOHNSON: Does anyone else wish to speak to the  
21       issue of importance of study and commensurate resources?

22       DR. CLARK: I think I would support all of your  
23       characterization of the importance of the -- both as sort  
24       of the movement for the state of the art, the idea of  
25       integrating groundwater and surface water modeling

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1 activities and then tying together with epidemiology.

2 I think there's also -- I'm sure the study's going to  
3 be scrutinized carefully by the public. And I guess what  
4 I'm concerned about is that we appear to do a study that's  
5 somewhat short of the best that we can do, then we could  
6 be criticized for that, for not taking it seriously and  
7 not understanding the public health implications of it  
8 because they're very serious because there's a lot of  
9 water systems that have similar kinds of problems.

10 And I can see that this could lead to, maybe, a  
11 further study or a more in-depth study of better  
12 understanding of what those exposures might be for other  
13 water consumers. So it seems to me that you've got to  
14 take it seriously and think of it as scientifically  
15 defensible. And I say resources are there. Use the  
16 resources to accomplish the end project -- the end goal of  
17 the project.

18 DR. JOHNSON: Anyone else? Eric? Ben.

19 MR. HARDING: I want to build a little bit on what  
20 Tom's saying because I started -- I think I -- I guess I  
21 started this ball rolling a little bit. And I want to say  
22 that just because something is possible doesn't mean it  
23 should be done. And I think that we have to ask ATSDR to  
24 really focus on important areas here. And this -- I think  
25 this is what we're all going to address individually.

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1           But I think the study is important in the two ways  
2           that you mentioned, and if ATSDR puts their emphasis on  
3           the areas that will contribute to an understanding of this  
4           situation and improving the practice, I think then it can  
5           be a very important study. I just want to echo Tom that  
6           it's important to make that and not take the resources and  
7           use them in areas that are going to just be generating  
8           friction.

9           So I'll make more specific comments, and I'm sure we  
10          all will. But I would like to see particularly -- this  
11          area of dealing with uncertainty quantitatively is an  
12          important one that's moving more into the practice; out of  
13          the universities and into practice. And I'd see some more  
14          effort spent there.

15          DR. JOHNSON: Thank you. Eric LaBolle.

16          DR. LABOLLE: I think this -- it may come back to  
17          something I touched on yesterday, which is: What is the  
18          role of these models that are being developed? And I  
19          think the answer at one point was, well, to provide  
20          monthly or submonthly, you know, concentrations, for  
21          example, with regards to the groundwater model and its  
22          inputs to the distribution system model.

23          And that may not be the role of the groundwater  
24          model. The groundwater model may play a role in simply  
25          bracketing the uncertainty in those concentrations that

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1 arrived, and the groundwater model may not be used to even  
2 predict the specific inputs used on any realization  
3 because that could certainly -- may be so great that one  
4 may just want to throw their shot at particular  
5 concentration inputs over time.

6 It depends on how much detail is put into these  
7 models and how much more effort is put into them. And I  
8 think from what I've heard -- essentially, I think  
9 everybody has a valid point hovering. And Tom,  
10 essentially, you know, we need to -- they need to make the  
11 best effort. You know, you certainly don't want to waste  
12 resources. But I think that the role of these models is  
13 really critical. You know, at what point do we say we're  
14 just, you know, beating a dead horse here?

15 DR. JOHNSON: Yes, Lenny.

16 DR. KONIKOW: In terms of the epidemiological study,  
17 is there a desire or a capability to look at the role of  
18 all the various contaminants? I mean, we were talking  
19 about PCE at the Tarawa Terrace. But there was also a  
20 benzene pollutant, and there's some TCE and PCE and some  
21 vinyl chloride at Hadnot Point and a longer list of  
22 contaminants. I mean, is this -- is there enough  
23 information to factor this into the epidemiological study?

24 DR. BOVE: Do you want me to answer?

25 DR. KONIKOW: I mean, this gets to, you know, what we

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1 might use the groundwater transport models to help define.

2 DR. BOVE: I mean, I don't think we have any  
3 information as to when Hadnot Point had more TCE than  
4 benzene. We don't have that data so that -- what we'll --  
5 the way that we've characterized Hadnot Point exposure is  
6 to a mixture of VOCs, TCE being the main component. But  
7 if we're going to say -- if we're going to infer from that  
8 -- if we see, for example, an elevated rate of childhood  
9 leukemia or whatever, we will be able to say, at most,  
10 that it's this mixture that caused the exposure, similar  
11 to what we did at Toms River when we said that -- what was  
12 the -- the Parkway well field, which consisted of TCE,  
13 PCE, and this exotic chemical, styrene, acrylonitrile  
14 trimer, and which one was it?

15 Well, they were all together. You know, or when I  
16 studied trihalomethanes, well, which one caused the neural  
17 tube defect increase? Was it the chloroform? Was it HX?  
18 What -- what was it? That's how Hadnot Point looks to me.  
19 It's a mixture with TCE being the main component, and to  
20 make inferences, I would have to say that TCE is the main  
21 component. But, just as you said, there's benzene.  
22 There's all these other contaminants that could also cause  
23 or be suspected of causing childhood leukemia.

24 DR. JOHNSON: Okay. The floor is open for things  
25 that you think have been not addressed or not addressed

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1       adequately, things that you commented on in premeeting.  
2       So let's put them on the table.   David.

3               DR. DOUGHERTY:   I'm just going to return to your  
4       suggestion because the panel statement had, in terms of  
5       advancing the state of the art, and just comment that what  
6       it really looks like to me is the other bookend to Dover  
7       Township that really is going to help define the  
8       limitations of the methodology because there's such great  
9       uncertainty here as compared to a very different case at  
10      the other end.

11             DR. JOHNSON:   Thank you.   Ben, do you want to start?  
12      Anything that's not been put on the table or put on the  
13      table to your dissatisfaction?

14             MR. HARDING:   I thought that's what we were doing  
15      just now.   Then we got interrupted to respond to your  
16      charge.

17             COURT REPORTER:   Microphone, please.

18             MR. HARDING:   Again, the issue, monochloride, we've  
19      raised it a couple of times, but I think it's something  
20      that should not be neglected in our reconstructions.

21             DR. CLARK:   I think that the issues have been  
22      addressed pretty thoroughly in an open forum.   I'm very  
23      satisfied with the discussion.

24             DR. JOHNSON:   David?

25             DR. DOUGHERTY:   (Shakes head)

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1 DR. JOHNSON: James?

2 DR. UBER: Well, just a couple of very specific,  
3 small questions.

4 DR. JOHNSON: I'm trying to make the point this is an  
5 open discussion.

6 DR. UBER: Open discussion; okay. Just because I had  
7 a couple of items here that I didn't have -- obviously, I  
8 didn't think I had answers to, and I was just curious. In  
9 the -- in the Hadnot Point area, what kind of plant  
10 production data is available now and historically?

11 MR. MASLIA: Basically the same that we have on all  
12 the plants. When we have asked for plant introductions,  
13 the one that we have monthly data for -- well, it gives us  
14 a chart, and it lists all the water-treatment plants.

15 DR. UBER: Okay. So nothing more than monthly?

16 MR. MASLIA: I haven't looked at the actual  
17 individual well records at Hadnot Point, but for the  
18 plant --

19 DR. UBER: The plant is monthly. So they didn't have  
20 to report anything daily or didn't report daily water  
21 production?

22 DR. POMMERENK: Actually, they do.

23 DR. UBER: They do?

24 DR. POMMERENK: I mean, in the recent past, I have  
25 personally have data from 1998 on this daily production at

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1 each of the plants.

2 MR. MASLIA: But not for the present -- not for the  
3 study period?

4 DR. POMMERENK: No; not for the study period. The  
5 information was also for the current.

6 MR. FAYE: All of the data that I'm familiar with  
7 from Hadnot Point, from the well-construction data to the  
8 contaminant data to the supply data, you could probably  
9 generally characterize that as at a higher level of  
10 quality and number -- somewhat higher level of quality and  
11 number than what is available or what was available for  
12 Tarawa Terrace.

13 We can define the relevant issues that we've all  
14 talked about in a well-production contamination, temporal  
15 distribution of contaminants, spatial distributions, et  
16 cetera. We can probably define that somewhat better at  
17 Hadnot Point. Historical record: somewhat better at  
18 Hadnot Point; not greatly record, but somewhat -- greatly  
19 better, but somewhat better than we could at Tarawa  
20 Terrace.

21 DR. UBER: But with regard to temporal resolution --

22 MR. FAYE: That too.

23 DR. UBER: Okay. So the subtext of that is that --  
24 the only reason why I'm asking that is because I'm  
25 thinking of the issue of interconnectiveness. And I'm

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1 thinking of just, in terms of the simplest model, if one  
2 had daily water production and one had information on  
3 base, then, you know, conceivably, you could look at a  
4 statistical approach that would allow you to say, with  
5 some degree of confidence, all of the water was -- all of  
6 the water within this area was coming from this plant or,  
7 no, there's definitely a shortfall. It had to come from  
8 somewhere else. That's why I was asking that.

9 MR. FAYE: I don't think -- the folks from Camp  
10 Lejeune can correct me. But I don't think the actual  
11 amount of water available versus need at Hadnot Point is  
12 not an issue. Where it was an issue was at Tarawa Terrace  
13 for a couple of years.

14 DR. UBER: I was talking about the Holcomb area,  
15 whether or not that ever got water from, you know, the  
16 other two interconnects. So it was my recollection you  
17 got about .8 MGD here and you got about three down here.  
18 That's the data that I saw. And so I'm thinking, you  
19 know, does it go down to .4 and go up to 3.4 on a  
20 statistical basis? That's what I'm trying to think about.

21 MR. FAYE: Everything that I know regarding the  
22 connection between Hadnot Point and Holcomb Boulevard is  
23 that there -- over the years from 1973 to the present,  
24 there were possibly some very short-term, intermittent  
25 connections between the two systems; i.e., Hadnot Point to

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1 Holcomb Boulevard. Okay? That's that connection.

2 Between Holcomb Boulevard and Tarawa Terrace, there  
3 was a supplemental connection, also possibly intermittent;  
4 but a lot more continuous than the previous situation  
5 between Hadnot Point and Holcomb Boulevard between 1985  
6 and 1987 Holcomb Boulevard to Tarawa Terrace. Okay?

7 DR. UBER: Okay. Well, that's just -- that degree of  
8 certainty that you just expressed is contrary to what I  
9 heard before. I mean, that was our whole -- the whole  
10 basis of our discussion of, you know, is Hadnot  
11 distribution system a self-contained entity or is there  
12 significant -- I'm sorry.

13 Is Holcomb a self-contained entity, or is there some  
14 leakage from a contaminated area? That comment just  
15 indicates that, no, or very, very intermittently. And so  
16 I'm -- yeah; with the exception of those two years.  
17 That's right; with the exception of those two years.

18 That was so -- we go back to the comments before that  
19 was when we were saying, you know, we need to have some  
20 archaeological investigation to look at this. So I'm,  
21 frankly, uncertain about the degree of certainty, I guess.

22 MR. MASLIA: Yeah; yeah. We definitely agree with  
23 that. And that's my take on the discussion this morning  
24 would be to put some effort into trying to reduce the  
25 uncertainty or refine the understanding on the

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1 interconnection issue.

2 DR. UBER: Okay.

3 DR. BOVE: It's very important because we're going to  
4 be telling people and putting it on our Web site that if  
5 you lived here at this particular time you were exposed or  
6 not exposed. This is going to be information for  
7 everybody -- anyone can see on the Web site, so we need to  
8 nail this down.

9 DR. UBER: Okay. So that was my rationale for asking  
10 those questions about the production -- production data.  
11 The other thing that I was just curious about is I think  
12 -- I guess I know the answer to this. But is there any  
13 data at all on customer complaints (laughter)?

14 MR. MASLIA: Well, this past spring I was on the  
15 airline, coming back to Atlanta, and one of the Marines  
16 that was on there with me -- they knew that we were doing  
17 some testing. And he says, "Well, the water tastes fine,  
18 but I could use a hot shower."

19 DR. UBER: All right. You know the reason why I was  
20 asking that is -- and I don't know anything about the -- I  
21 don't know anything about taste and odor thresholds for  
22 the levels of these contaminants. But if they had any  
23 kind of record-keeping of complaint data or things or even  
24 in terms of surveys of people. If anybody here knows  
25 anything about taste and odor thresholds, it might be an

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1 interesting survey question. You know, did the water  
2 smell like gasoline, that type thing.

3 DR. JOHNSON: Okay. Any unfinished business, Lenny?

4 DR. KONIKOW: Well, I think yesterday in the modeling  
5 we had lots of specific comments and everything, and I'm  
6 sure you'll consider them. I have just one residual  
7 specific question, which I don't recall was addressed, and  
8 it may have been.

9 But in advective transport, I think Bob said -- or at  
10 least I remember reading in the report -- that he placed  
11 or seeded particles 600 feet, I believe, east or west of  
12 ABC Cleaners; west, I believe. And this somehow led to  
13 the conclusion that the source of PCE in TT-23 was not the  
14 ABC Cleaners. Am I remembering that right or wrong?

15 MR. FAYE: Well, you're -- you are remembering it  
16 right, but the conclusion is wrong. It was just a poorly  
17 written statement, Lenny. What I meant to say was that,  
18 yeah, I think ultimately the PCE anywhere in that  
19 vicinity, the source was ABC Cleaners.

20 DR. KONIKOW: Okay.

21 MR. FAYE: It's just that when the -- when TT-23 was  
22 turned on, probably some time in the summer of 1984, and  
23 only operated for, maybe, four or five months and in  
24 January of 1995 all of a sudden here are these elevated  
25 concentrations of PCE found in the well and you're 1600

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1 feet from ABC Cleaners, the conclusion that I was trying  
2 to draw or make was that, obviously, whatever PCE entered  
3 that well in that very short interval of pumping had to be  
4 much nearer the well than ABC Cleaners.

5 And then I went on to the explanation of the  
6 overlapping, contributing areas and suggested a  
7 possibility for how that area north, immediately north, of  
8 TT-23 had become somewhat contaminated with the PCE. So  
9 you remembered it right, but I wrote it wrong.

10 DR. KONIKOW: That's okay. Thanks.

11 DR. JOHNSON: Tom, unfinished business?

12 DR. WALSKI: Okay. Well, since I've been accused of  
13 being on hallucinogenics, I might as well continue  
14 hallucinating here and make an observation that I think's  
15 going to happen is: If we sat here today and figured out  
16 about when the plume hit Well TT-26, we could probably --  
17 with the data we have, including the model we've run, we  
18 could probably say it's about the six-month window.

19 So what we're going to do is take another year and do  
20 -- and possibly do a tremendous job. It's going to be an  
21 outstanding modeling job and put all the uncertainty on,  
22 and I'll bet the answer's going to be about the same  
23 six-month window that we go today. That's my prediction  
24 of probably what is going to come out of the results.

25 But having said that, I think, you know, the study

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1 team's outstanding. I have tremendous respect for the  
2 ATSDR people: Bob and the others. I think they're doing  
3 just a super job, and, you know, if anything, they're  
4 probably doing a little too good of a job, but that's, you  
5 know, not a bad criticism.

6 DR. JOHNSON: Okay. Thank you. Vijay, anything  
7 that's not been addressed to this point that you'd like to  
8 bring up?

9 DR. SINGH: No.

10 DR. JOHNSON: Peter?

11 DR. POMMERENK: I don't have anything either.

12 DR. JOHNSON: Eric?

13 DR. LABOLLE: I'm clean (laughter).

14 DR. JOHNSON: This is a government facility,  
15 gentlemen. I don't know if there's anyone out there with  
16 bottles waiting for us or not.

17 DR. LABOLLE: But I would like to comment on the  
18 six-month factor. I really -- I think that that's -- not  
19 the six-month factor, the six-month window of arrival time  
20 here.

21 I think that that's a bit optimistic. Actually, my  
22 experience has been if one were to really address the  
23 level of uncertainty of the hydrogeology with a method  
24 capable of doing that -- and at this point, I don't see  
25 that that is in the cards for this, given the time frame

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1 in which they want to complete the job and the approach  
2 that's been taken already. I think you're already down a  
3 path that doesn't allow for the kind of thing I refer to.

4 But in that context, I think one would find that the  
5 uncertainty in arrival would actually be much greater than  
6 that, possibly. I mean, TT-26 may be close enough to the  
7 source that that's narrowed down some of the six months  
8 and is still kind of optimistic.

9 DR. WALSKI: So I'm even being too optimistic then.

10 DR. LABOLLE: But it may be -- it may be quite -- it  
11 may become clear with a little more analysis that it  
12 certainly did arrive prior to the study period beginning  
13 in '68. And that's something, I think, that that's  
14 another role for the groundwater model in this context.

15 DR. JOHNSON: Okay. Before I, starting with Eric,  
16 ask for your individual recommendations and advice on the  
17 groundwater work or the system distribution work, Morris  
18 and Frank, are there things that are unfinished in your  
19 minds? Are there things that you want the panel to  
20 address now that haven't been addressed?

21 MR. MASLIA: No; only, Jim, you did ask about water  
22 quality complaints, and Jerry just brought this document  
23 here. Under Item No. 37, it says, "There have been  
24 complaints concerning water quality residents aboard Camp  
25 Lejeune." And that's dated -- I don't have the exact date

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1 on this, but it's one of the released Camp Lejeune  
2 documents. So there apparently have been complaints. But  
3 other than that -- '93. It's 1993.

4 Other than that, we've gotten -- or at least I've  
5 gotten some clear indications and clear assessment of what  
6 we've done and what we need to do. And I'd just like to  
7 thank each one of the panel members. I think it's always  
8 better to have internal discussions as opposed to, as  
9 Frank said, putting it out on our Web site and then  
10 hearing the discussions.

11 DR. JOHNSON: Don't be too conciliatory. You've not  
12 heard their final recommendations. Frank, anything that's  
13 not been discussed to your satisfaction?

14 DR. BOVE: Thank you very much.

15 DR. JOHNSON: Okay. Starting with Eric and then  
16 working our way around, I'd ask for your individual  
17 recommendations as to how ATSDR should proceed, given this  
18 day and a half of discussions, and you can give that  
19 advice, make those recommendations any way you wish:  
20 specific to groundwater, specific to the water-  
21 distribution systems, or both. So here's your -- at least  
22 for this meeting of this expert panel. What are your  
23 recommendations?

24 DR. LABOLLE: I suppose I'd begin with regards to the  
25 water-distribution system, parsing out this chronology, as

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1 has been suggested by members of the panel, and focusing  
2 on those times when we know there was contamination in the  
3 system and there wasn't interconnection and assessing the  
4 need for the water-distribution system during those times  
5 -- the water-distribution system model during those times.

6 And I think the model itself that's been constructed  
7 to date may be useful in this for showing that, you know,  
8 what comes in this one line into the system reaches the  
9 tap. It may be obvious to those of us sitting here, but  
10 it may not be obvious to the public. And I think that I  
11 would recommend at least demonstrating that to the effect  
12 that it can be demonstrated and then identifying those  
13 other areas where the water-distribution system model may  
14 be important.

15 And I think if there's effort to be put into that  
16 that's what I would focus on in terms of the water-  
17 distribution system model. In terms of the groundwater  
18 model, as I mentioned several times, you know, my  
19 principal concern is with the geologic uncertainty and the  
20 source terms to the system and how they're modeled and a  
21 way to the uncertainty within the context of the model.

22 If there isn't the plan to do that in a realistic  
23 way, a geologically realistic way, then one should  
24 acknowledge, you know, the outcome of what they're seeing  
25 and the uncertainty in the outcome with regards to the

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1 pre-existing characterization that kind of went into it  
2 and the inability to modify that within the context and  
3 the constraints of the modeling approach.

4 And I think that that's important because that's --  
5 what it's going to do is constrain the model outcome to  
6 kind of a precondition, you know, range of exposure  
7 estimates that don't necessarily encompass the degree of  
8 uncertainty that we really have about this system.

9 DR. JOHNSON: Thank you. Peter.

10 DR. POMMERENK: Yeah. My recommendations follow  
11 almost exactly on that line. I think the focus on the  
12 groundwater modeling should be on determining the range of  
13 concentrations and times that the contaminants may have  
14 arrived or may not have arrived at the wells. And as the  
15 panel has, in my opinion, fully stated that's the driving  
16 force for everything that is downstream of that.

17 So again, yeah, the focus should be -- you know,  
18 several suggestions have been made, you know, for example,  
19 Monte Carlo simulations and so on, to derive a measure of  
20 the uncertainty of those values that come out of the  
21 groundwater model.

22 With respect to the water-distribution modeling, if I  
23 understand this correctly at this point, the main  
24 uncertainty that we have right now left over is the degree  
25 of interconnection between Holcomb Boulevard and Hadnot

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1 Point. Although we have heard -- we've heard two opinions  
2 that think that these interconnections were only  
3 intermittent and short-term connections. It would be good  
4 to just be certain of this fact, if possible, and go from  
5 there.

6 If, indeed, these interconnections don't have any  
7 effect on the epidemiological study, then we can  
8 essentially proceed and say, you know, whatever comes into  
9 the plant goes out everywhere in the distribution system,  
10 and that would essentially eliminate the need to, you  
11 know, develop further sophisticated distribution-system  
12 models.

13 My recommendation is not to continue on the field  
14 efforts at this time until these issues have been  
15 resolved. That's all I have.

16 DR. JOHNSON: Thank you. Vijay.

17 DR. SINGH: Essentially, I would just reiterate what  
18 has already been said earlier as well as this morning and  
19 yesterday. First of all, I would like to take this  
20 opportunity to state on the record that the ATSDR group,  
21 especially Morris Maslia and his group, have done really  
22 an outstanding job, and I have nothing but admiration  
23 for their work, both quality-wise as well as scientific  
24 rigor-wise.

25 Having said that, coming back to the groundwater

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1 modeling area, as we have cited so many times, I think  
2 it's important that there is a clear statement and a clear  
3 discussion of the model assumptions, the hypotheses, as  
4 well as the model limitations because no model is a  
5 perfect model. That's why we call it as a model.

6 And from the standpoint of public, I think it's very  
7 important to say very clearly what the assumptions are and  
8 what the model limitations are and which model hypotheses  
9 are, which directly would reflect on the quality and the  
10 reliability of the model.

11 And then the issue of uncertainty and risk analysis  
12 that we have been discussing since yesterday -- I think in  
13 the groundwater modeling area -- this issue has to be  
14 clearly, explicitly taken into consideration, and then  
15 there has to be a better accounting of the recharge, which  
16 really has not been done so far. Recharge has been taken  
17 as an average value on a yearly basis, which in my view is  
18 a very gross estimate of the rainfall water that goes into  
19 the ground.

20 After all, it is the rainfall water which enters into  
21 the ground which is responsible for transporting the  
22 contaminants into the groundwater body. And so it is, to  
23 me, of importance that the water percolation and the water  
24 recharge are more accurately estimated and included in the  
25 groundwater modeling area.

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1           In terms of the water-distribution network, I think  
2           what Peter and Eric have said, I tend to concur with. The  
3           original effort on water discovery, I think, will be well  
4           worth the effort because there is no substitute for data,  
5           for data is the only source through which we get the  
6           information through which we communicate with nature. So  
7           I would strongly suggest that they continue their effort  
8           in terms of discovering or rediscovering the archaeology  
9           of the data as far as they can go.

10           But I also tend to concur with Tom in terms of the  
11           water-distribution modeling. I think the important point  
12           here is once the groundwater model produces water  
13           contamination through which we can quantify the water  
14           contamination at the wellhead and we can also have some  
15           data on the water contamination in terms of time and the  
16           depth. I think that is what is essentially going to be  
17           primarily responsible for determining the exposure from an  
18           epidemiological viewpoint. And I think that, to me, is  
19           essentially the central issue, which is what all this  
20           interval is meant for.

21           And so I'm not quite certain if a very detailed  
22           water-distribution modeling is really necessary. I think  
23           a simpler one might suffice, but if they have already done  
24           it and they're doing it, it certainly it's not going to  
25           hurt.

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1 DR. JOHNSON: Thank you. Tom.

2 DR. WALSKI: Okay. Thanks. Yeah. I want to just  
3 second, I guess, what other people have said, and we have  
4 an excellent study team here, and they've done a very  
5 high-quality job. And it's just really ironic to find  
6 myself in the position of not selling modeling because  
7 usually that's what I do for a living is sell models and  
8 try to get people to use them. So I find myself, kind of,  
9 in an odd position here of saying, "Don't put too much  
10 emphasis on the models, but go for the real data."

11 And trying to -- I think, maybe, you might remember  
12 things better if I could just tell a story here. There's  
13 a guy walking down the street and sees another fellow on  
14 the ground on his hands and knees, looking around. The  
15 first guy -- he goes, "Well, what are you doing down  
16 there?" And he goes, "Well, I lost a \$50 bill. I can't  
17 find it.

18 So the second guy comes and helps the guy look for  
19 the \$50 bill, and after about five minutes, he says,  
20 "Well, how come you haven't found it? I mean, where did  
21 you lose it?" And he goes, "Well, I lost it over there in  
22 that vacant lot." And he goes, "Well, why aren't we over  
23 there looking?" And he goes, "Well, it's dark over there,  
24 and there's broken glass and rats and stuff. I don't want  
25 to go over there."

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1           And I think that's kind of the position that the  
2           study team is in. It's kind of nice to work with models,  
3           but I think they're going to have to spend their time in  
4           the archives with the rats and the broken bottles, looking  
5           for data because that's where you're going to get the most  
6           for your effort is not being under a light in a nice area,  
7           but going to the archives and digging. And I think  
8           they're a qualified team, and they're going to do a great  
9           job with this.

10           DR. JOHNSON: Great. Thank you. Lenny.

11           DR. KONIKOW: Well, again, I second all the comments  
12           that have been made up to now. I again just reiterate  
13           with the groundwater modeling and the transport modeling  
14           that ultimately we're limited in what we can do in terms  
15           of the available data. I mean, you know, we don't have  
16           concentration data before 1980 or '82. And so everything  
17           we do for looking at distribution before then is going to  
18           be a little fuzzy.

19           We'll do the best we can with the flow model. You'll  
20           do the best you can with the flow model based on the  
21           distribution of pumpage, and that may be about the best  
22           you can do. In terms of, you know, the modeling approach  
23           and sensitivity analyses, this is all stuff that should be  
24           done. And one of the things to keep in mind is that your  
25           hydraulic heads in your flow model may be relatively

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1 insensitive to certain things to which the concentration  
2 distribution is highly sensitive.

3 And so there's not necessarily a direct transfer  
4 value in terms of the sensitivity analysis and uncertainty  
5 analysis between the flow and transport model. So it's  
6 just something to be aware of.

7 DR. JOHNSON: Jim.

8 DR. UBER: I'll leave it to the groundwater  
9 colleagues to talk about the -- what particular elements  
10 to include any probabilistic analysis or whatever form  
11 that may take, and I think that's clearly appropriate. My  
12 only reason for mentioning that is that I would have a  
13 suggestion that -- about the way the results of those  
14 analysis be portrayed. And specifically, for me, I focus  
15 on the precise connection between the groundwater resource  
16 and the water-distribution system, which is this pipe  
17 header that comes from the well field and goes into the  
18 distribution system.

19 And I think that the results of that stochastic  
20 analysis should be expressed in terms of the uncertainty  
21 or some type of interesting plot of the variability or  
22 uncertainty or both in that concentration that it is  
23 delivered to the distribution system, considering not only  
24 the uncertainty and the geohydrologic variables and the  
25 model set-up, but also the uncertainty in how the wells

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1 are operated.

2 I believe that if the uncertainty in that quantity is  
3 quantified within some bounds, then what we have been  
4 talking about today, which is to, maybe, allow data  
5 discovery to drive the train for a little while longer.  
6 If we continued on data discovery and then you had the  
7 results of that uncertainty analysis, then between those  
8 two, I think it would become clear what to do, if  
9 anything, more with the water-distribution system model.  
10 And I would just leave it at that.

11 DR. JOHNSON: David.

12 DR. DOUGHERTY: Well, yeah, I think people have hit a  
13 lot of the points, and we could repeat them several times,  
14 as we have through the past couple of days. I think the  
15 summary that I have is that the model complexity is too  
16 far out in front of the data in the characterization of  
17 the uncertainties. It's something that can be corrected,  
18 I think, and reasonably without major correction. It's  
19 just a correction.

20 The three issues that come to mind, and two of them  
21 are on the groundwater side and one's a general, easy  
22 observation about the archaeology, about interconnects.  
23 And so that's number three, but the first two are about  
24 the things that drive concentrations in the groundwater  
25 delivered by the wells.

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1           There's the pumping schedules that, I think, keep  
2           coming up, but I'm not sure we can do very much about  
3           them. The things that we haven't characterized enough are  
4           source, the mass loading, and the accretion; not just the  
5           reinfiltration but the septic returns and making sure  
6           we've got those in a time -- reasonably timed; very, very  
7           consistent with the climate.

8           And finally, making any statements about the  
9           groundwater issues for Hadnot, I don't feel comfortable  
10          about it. I don't think we've had enough conversation or  
11          information about that, and that may be something that you  
12          may need your next panel to tend to.

13          DR. JOHNSON: Thank you. Robert.

14          DR. CLARK: Well, I don't think I'm going to say  
15          anything new or original, but I am generally supportive of  
16          the current plan. But I think with any project of this  
17          complexity and magnitude, there always adjustments that  
18          take place in the process. And it seems to me that a  
19          couple of those are the re-emphasis on data discovery,  
20          which I think is a very important issue.

21          But the uncertainty issues with regard to the model  
22          parameters and the stochastic nature of demand and then  
23          the consequences of those yield in terms of the output and  
24          data reliability. It seems to me that the real issues  
25          surrounding this study are really going to come in the

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1 public health and public policy area in terms of the  
2 epidemiological results. Excuse me. That's going to be  
3 the one that the public is going to look at, and the  
4 public health community is going to look at very, very  
5 carefully.

6 So I would suggest anything that needs to be done to  
7 support effort to make it more scientifically defensible  
8 is an important aspect to the project with the only  
9 comments, which I've made before, that the issue of  
10 transformation by-products is an important one to look at.

11 And also, what has actually been measured, I guess,  
12 in terms of some of the samples that have been taken prior  
13 to the establishment of the MCLs or vault organic  
14 chemicals, and this concludes an excellent team. I'm more  
15 impressed after listening to the presentation than I was  
16 before when I read the background data.

17 DR. JOHNSON: Thank you. And Ben.

18 MR. HARDING: I want to thank Morris and ATSDR team  
19 for the opportunity to sit in on this panel. I'm very  
20 impressed with what you guys have done. It's an eye-  
21 opener to see some of the kinds of efforts you guys have  
22 made.

23 What I want to suggest is that now you sort of step  
24 back and take a higher level look at this again. Take a  
25 little break. Reassess the requirements, starting with

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1 the epidemiological study. Just say, "What is it that we  
2 absolutely have to have and what are the things that are  
3 just sort of nice?" And probably just toss the latter.  
4 But certainly prioritize your requirements, and then make  
5 a decision based on a prioritization how you want to use  
6 your resources best.

7 With regard to the groundwater, which I can only  
8 kibbutz about, but I think it seems clear that the Hadnot  
9 Point situation requires some more understanding and  
10 possibly some more quantitative work modeling simulation.

11 I think in support of that and in support of, also,  
12 the water-distribution system, it's appropriate to do more  
13 of what we've referred to as data archaeology and continue  
14 in parallel while you're assessing your requirements. It  
15 seems that the groundwater work should express the  
16 uncertainty of, at least, the arrival time quantitatively  
17 and in a probabilistic framework.

18 With regard to the water-distribution system, the big  
19 issue here, it seems to me, is -- well, it may not be the  
20 biggest issue, but it seems to be the most contentious --  
21 is to understand these interconnections. And I would  
22 suggest that if it turns out the systems are  
23 interconnected and they're interconnected in such a way  
24 that water flows from Hadnot Point into Holcomb Boulevard  
25 based on the grades that you consider excluding those

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1 periods of time and those populations that are affected,  
2 if you could possibly do that, rather than trying to model  
3 that particular situation.

4 Otherwise, in the other periods where the systems can  
5 be viewed as operating independently, I think the simple  
6 mixing models are adequate. And there, the most important  
7 issue, aside from the groundwater arrival time, is the  
8 dispatch of the wells. And that might be supported by the  
9 data archaeology.

10 And then, finally, and I think this would be a big  
11 contribution to the practice. Again, I've said this over  
12 and over and over again. But to apply methods of  
13 propagating your uncertainty quantitatively. Typically,  
14 Monte Carlo is the way people do that. It doesn't mean  
15 you have to run your groundwater model in a Monte Carlo  
16 framework. There's other ways to do.

17 I think it's practical, and I'd take a real hard look  
18 at that because it's very clear from our discussions there  
19 is a lot of uncertainty here. And again, thanks for the  
20 opportunity. I've very much enjoyed this. I'm very  
21 impressed with what you guys have accomplished.

22 DR. JOHNSON: Okay. Any reaction from the agency  
23 representatives before we close?

24 MR. MASLIA: Only to thank everyone for spending the  
25 time going through the material. Obviously, it was not a

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1 polished report by any means. But, again, to emphasize,  
2 we do take your recommendations and suggestions very  
3 seriously. It will, I believe, help guide us. We were at  
4 a stage where we needed, at least, some external input and  
5 guidance and just to thank everyone for their time and  
6 effort.

7 DR. JOHNSON: And in closing, one observation from  
8 the Chair. I've mentioned the term "cost benefit." And I  
9 think, as Ben and others said, I think you -- there's time  
10 now, and I think there's need now for the agency to step  
11 back and reflect and digest what you've heard over the  
12 past day and a half.

13 And I think you need to ask yourself, in the vain of  
14 getting data in which you have confidence, what benefit is  
15 it going to be toward that goal if other activities are  
16 done or not done? What's going to be the cost of some of  
17 these things you've put on the table? And perhaps, as a  
18 result of the last day and a half, some suggestions have  
19 been to perhaps reorder those activities? So take a hard  
20 look at the cost of what you're proposing to do in the  
21 future, factoring in the advice you've heard here from  
22 this panel.

23 And with that, I'd like to close by thanking, as the  
24 Chair, this panel. I've been in public health for about  
25 40 years, and so I've attended lots and lots of meetings.

NANCY LEE & ASSOCIATES

1 I've been on lots and lots of committees. Some  
2 committees, I've chaired. Some other committees, I simply  
3 chewed on as a member. But this is, certainly, in my  
4 experience, the most able and the most helpful committee  
5 of which I've had the privilege of being associated. So  
6 really, accolades to the panel.

7 I'd also like, on behalf of the panel, to thank the  
8 agency representatives: Morris, Frank, Bob Faye, and  
9 others who really in an exemplary way represented the  
10 agency and interacted with this panel and with the public  
11 representatives.

12 On behalf of the panel, I also would like to thank  
13 the public input and the public representatives here. And  
14 what was added was really important insights that we would  
15 not have had otherwise brought forward and were very  
16 valuable.

17 A special thanks to our reporter, who kept us all in  
18 line, starting with the Chair. So many thanks for your  
19 expert work. And lastly, many thanks to the  
20 administrative staff, Ann Walker and her colleagues, who  
21 have made much of what has been brought to you happen in  
22 terms of materials, arrangements, et cetera, et cetera.

23 So with that, using the prerogative of the Chair, I  
24 declare us adjourned. Thank you.

25 (Whereupon, the proceeding was adjourned at

NANCY LEE & ASSOCIATES

1 approximately 1:35 p.m.)

NANCY LEE & ASSOCIATES